AECOM

Environment

FINAL REPORT

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Submitted to:

Mytrah Energy (India) Limited

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Quality Control/Quality Assurance

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Anchal Jain	Reconnaisance Site Survey, Ideinfication of Environmental Monitoring Locations, Stakeholder Consultation, Preparation of Chapters on Project Description, EIA process and Methodology, Evaluation of Legal And Administrative Frameowrk, Preparation Of Environmental And Social Management Plans
Deepthy Mukundan	Reconnaisance Site Survey, Assisiting in Identification Environmental Monitoring Locations, Involved in Stakeholder Consultation and Preparation of Chapters on Analysis of Alternatives, Environmental Baseline Analysis
Govind Singh Rathore, Anu Wazir	Primary Ecological Assessment at site and Preparation of Chapter on Ecological Impact Assessment and suggesting suitable mitigation measures
Jayakrishna Vasam	GIS and Land Use Mapping, preparation of digitized maps required for the project.
Rajshree Das	Reconnaisance Site Survey , Social Baseline Data Collection And Analysis, Stakeholder Consultation, Preparation of chapter on Socio-Economic Environment, Noise Modelling And Impact Assessment, Shadow Flicker Modelling and Assessment of Results, Compilation of Report

EXECUTIVE SUMMARY

I. Introduction

Mytrah Vayu Indravati Pvt. Ltd (herein after referred as 'MVIPL'), is a subsidiary of MEIL and intends to develop a 105 MW Wind Power Project in Vajrakarur Mandal, Anantapur District, Andhra Pradesh (herein after referred to as the 'Project'). The project envisages installation of 50 X 2.1 MW, Suzlon S-97 Wind Turbine Generators (WTG).

In order to ensure that the project is established in a manner that is socially responsible and reflects sound environmental management practices, MVIPL intends to carry out an Environmental and Social Impact Assessment (ESIA) study for the Project, in accordance with International Finance Corporation's (IFC) Performance Standards (PS) on Social and Environmental Sustainability, 2012; Environment, Health and Safety Guidelines, 2007 and Asian Development Bank (ADB) Safeguard Policy Statement (SPS), 2009.

MVIPL intends to set up a 105 MW wind power project spread across private land procured from seven villages i.e., Tatrakallu, Vajrakarur, Gadehothuru, Pottipadu, Gulapalem, Konakondla and Kamalapadu of Vajrakarur Mandal, Anantapur District. The project will comprise of 50 WTGs with a rated capacity of 2.1 MW each. MEIL through its 100% owned project SPV, Mytrah Vayu Pennar Pvt. Ltd (MVPPL) has an operational 63 MW wind project in the vicinity of the proposed project site at Vajrakarur, at an aerial distance of 2 km.

For the development of the project, MEIL has engaged M/s. Suzlon Energy Limited (hereinafter referred as 'Suzlon') as the Erection Procurement and Construction (EPC) Contractor on turnkey basis. Suzlon will be responsible for wind resource assessment, land procurement, obtaining necessary statutory approvals, supply, installation and commissioning of the project WTGs, construction of internal roads and transmission lines (internal and external). Thereafter, a separate contract will be executed for operation and maintenance of the project between MEIL and Suzlon. MEIL has entered into a comprehensive Business Partnership Agreement (BPA) with Suzlon Energy Ltd on 8th May 2010 for 3000 MW of installed capacity of wind power. The proposed project of 105 MW forms a part of the proposed capacity to be installed by Suzlon. Operations & Maintenance (O&M) Services for the project are proposed to be provided by Suzlon for a period of 20 years

II. ESIA process and methodology

The methodology implemented for conducting the ESIA study includes the following:

- A regulatory review was undertaken in order to understand the applicable, local and national legislation, policy and regulatory frameworks;
- A detailed social and environmental assessment of site and the surrounding areas were undertaken through:
    - Reconnaissance surveys for all the turbine locations to understand site specific issues;

  - Discussion with the local community in the project villages to understand their perception about the project and identification of key issues pertaining to similar projects in the region;
  - Baseline data collection for air, water, soil quality and ambient noise level in the Project area through primary monitoring; and
  - Ecological assessment for the project area through primary and secondary surveys.
- Collection of secondary information on social aspects of the site through consultation with the local community to understand the community perception with regard to the project and its activities;
- Assessment of impacts, including cumulative impacts, based on understanding of the project activities and existing baseline status; and
- Preparation of Environment and Social Management Plan (ESMP).

III. Project Description

Project brief

The wind power project comprises 50 WTGs of Suzlon make, S-97 model (rotor diameter of 97 m and hub height of 90m and tubular tower) of 2.1 MW rated capacity totalling to 105 MW. WTGs are spread across seven (7) villages situated in Vajrakarur Mandal of Anantapur District,Andhra Pradesh. The project is currently in preliminary construction phase. Suzlon is the Erection, Procurement and Construction (EPC) Contractor for the project and will be responsible for all activities from procurement of WTGs to commissioning of the entire project.

Site Settings

The project site is located approximately 40km North-West from Anantapur city and 9 km south of Guntakal Town. The site is accessible by State Highway (SH) 26 which connects Konakondla and Vajrakarur villages. The site is majorly characterised by plain terrain with prevalence of black and red soils covered with few shrubs and trees at some of the locations. Crops species such as castor (*Ricinus communis*), Sunflower (*Helianthus annuus*), and ground nuts (*Arachis hypogaea*) were sown in the land identified for installation of WTGs.

The surrounding area comprises of agricultural lands and scattered villages which indicates a rural setup. Water is a scarce resource in the area and no major lakes or ponds were observed in the region except a surface water body *'Satya Sai Reservoir'* ,located at a distance of 2.8 km from WTG No. PPD 82 and a pond in *Pottipadu village,*located at a distance of 500 m from PPD 01. *Handri-Neeva Sujala Sravanthi* (HNSS) Canal is situated towards west of the project site, WTG No PPD 28 being the nearest located at a distance of 100m in east direction from the canal.

Land use

The project area can be characterised by undulating land with an average elevation in the range of 455 to 480 m above mean sea level (amsl) and comprises predominantly of rain-fed agricultural land. Proposed site is located in rural set up and land use pattern of the surrounding area comprises of fallow land followed by irrigated land and barren land at few project locations.

Current Status

The wind power project comprises of 50 turbines and the project is in its preliminary construction phase during the site visit. Out of the 50 WTGs, locations for 41 WTGs have been identified and land has been procured. For the remaining nine (9) turbines (PPD 63, PPD 64, PPD 61, PPD 60, PPD 52, PPD 80, PPD 53, PPD 54 and PPD 50), Suzlon is in the process of identifying and finalising the WTG locations. It was observed that out of the 41 project turbines, five (5) WTGs locations were excavated, reinforcement works of two (2) WTGs locations were completed and curing works of two (2) locations were going on. The construction and excavation works for access roads and internal transmission lines have been initiated. Construction works pertaining to 100 MVA transformer at 132/33 kV Suzlon Pooling Substation located at Vajrakarur Village is under progress.

Based on wind resource assessment undertaken for the proposed project by 3 TIER, the mean wind speed at hub height of 90 m has been calculated to be 6.75 m/s.

Power Evacuation Scheme

The power generated from 19 WTGs to be commissioned (39.9MW), will be stepped up to 33kV by 0.69/33 kV transformers which are installed along with associated switchgear for each turbine. The power will be evacuated through 14 km long double circuit 33kV transmission line to the 132/33 kV Grid Substation of Transmission Corporation of Andhra Pradesh (AP TRANSCO), at Guntakal

The power generated from the remaining 31 WTGs (65.1 MW) is proposed to be evacuated through a 3 km long double circuit 33 kV transmission line to 132/33 kV Power Substation developed by Suzlon at Gade Hothur village. Further, power will be transmitted to 220/11 kV Ragulapadu Grid Substation of AP TRANSCO situated at a distance of 5.3 km from substation developed by Suzlon. Approval from construction of transformer has been received from APTRANSCO.

Project Development

The construction phase of the proposed project will involve land surveying, geotechnical investigation, component delivery; construction of access roads, turbines lay down area, crane pads, WTG foundation and electrical substations followed by final erection and commissioning of power generating facilities and its auxiliaries. The construction works will also entail site clearance and levelling works along with development of material storage yards.

Resource Requirement – Construction Phase

During construction phase, the labour requirement will range from 50-60 during normal operations and 70-100 workers for peak construction activities. The labour required for the construction will be hired locally only and no significant influx of migrant population is expected due to the proposed project. Only skilled workers required for crane operation and electrical works will be brought in from outside, which will be limited.

The water demand during the construction works will be about 3 m^3 /day and 4.5 m^3/day during normal and peak operations respectively and will be sourced through authorised/approved tankers. Measures for disposal of sewage generation during construction phase of the project will be provided such as installation of adequate number of Portable toilets which shall be cleaned at regular intervals.

The construction activities will lead to generation of wastes such as construction debris, waste from packaging and crafting material for wind turbine components. The movement of heavy machinery for site clearance, earth moving, transportation and erection of wind turbine components will generate waste oil, hydraulic oil, lubricants, paints, degreasers and gearbox oil. Waste oil is classified as a hazardous waste and its storage, transportation and disposal has to be in accordance with the Hazardous Waste Management Handling and Trans-boundary Movement Rules 2008 and amendments. The hazardous waste generated will be sent to an approved recycler.

Resource Requirement – Operation Phase

The operation and maintenance of wind turbines will be undertaken by Suzlon. The site will have 20-25 personnel's at site including maintenance, monitoring and security staff during the operation phase. It is proposed to engage people from local community as security staff.

The water requirement for the project is limited to domestic consumption i.e., drinking water will be met through packaged drinking water.

Waste water generation during the operation phase of the project is limited to the domestic waste water from the toilets. Septic tanks with adequate capacity shall be maintained at the project site for managing the waste water generated.

IV. *Analysis of Alternatives*

United Nation's Intergovernmental Panel on Climate Change (IPCC) has projected that renewable energy can provide approximately 77% of global primary energy supply by 2050. The state level incentives provided by the new government of Andhra Pradesh are attractive enough to influence the wind power companies.

As mentioned in the sections above, the project has many advantages like elevating the standard of rural economies, increasing the power supply of the energy deficit state of Andhra Pradesh in an environmentally friendly manner. Hence, the project with all the chosen options – site, mode of power generation, route of transmission line etc – is the appropriate alternative and is beneficial for the region.

V. *Socio- Economic Environment*

All the WTG locations falls within seven (7) village namely, *Thatrakal, Vajrakarur, Gade Hothur, Pottipadu, Gulapalem, Konakondla* and *Kamalpadu* of Vajrakarur mandal of Anantapur district. The total population of the village as per Census, 2011 is 2997 with literacy rate of 59.2% for males and 40.8% for females. The occupations of the local people are agriculture based livelihoods such as cultivators, agricultural labourers and livestock rearing.

Women in the area also actively involved in cultivation, agricultural labourers and household chores. In addition to daily household chores and agricultural work, women in these villages are involved in other income generating occupations such as tailoring jobs, running kirana shops and selling of milk produced from the livestock. Some females were reported to be employed in contractual jobs such as road sweeping and agricultural labourers issued under the provisions of the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA).

VI. Stakeholder Consultation

From the stakeholder consultations conducted by AECOM, it can be concluded that the land contributors/owners are positive about the proposed wind power project. They are satisfied with the negotiation procedure followed for land procurement and the compensation being paid to them is above the prevailing market rates. Also, the land owners are willing to sell off their non-productive/fallow land at such prices.

However, it is imperative to mention that the local villagers and women folks are unconvinced about the growing wind power projects in the area which according to them is causing a decline in rainfall in the area. Therefore, it is expected that MVIPL in coordination with Suzlon shall address such misconceptions by setting up awareness camps and providing adequate information on the lack of any such impacts on the micro climate due to wind power projects. The women folks also expressed their expectation availability of good portable drinking water using RO system in their village which is very much needed for a drought prone area like Anantapur will scanty rainfall and depleting ground water levels.

VII. Noise Environment

During the field survey, a total of eight (8) potential noise receptors were identified, consisting primarily of built structures and settlements such as a small house in the field, temple and villages. Primary Noise monitoring was carried out for continuous 24 hours at all the identified receptor locations by a NABL Accredited Laboratory to evaluate the baseline noise levels at the project site.

It was observed that the noise levels at the monitoring locations ranged from 48.1 dB (A) to 53.2 dB (A) during day time and 35.0 dB (A) to 40.0 dB (A) during night time. The baseline noise levels in the area are thus within the prescribed CPCB standards of 55 dB (A) and 45 B (A) during the day and night time respectively at all locations.

VIII. Ecological Environment

The proposed project-area contains a mosaic of natural and modified habitats which is supporting a variety of flora and fauna, and providing various ecosystem-services to the local communities. The remnant patches of natural vegetation in the area are providing habitats to a fairly good diversity of wild fauna.These patchy natural habitats are also likely to be acting as wildlife corridors which connect the faunal populations inhabiting the region. The proposed project-area also contains critical habitats, in the form of potential roosting, foraging and nesting sites of some globally threatened, a few endemic and many migratory species.

The wind-turbines that are part of the project have the potential to impact those avifaunal species of the project-area that are known to be particularly vulnerable to risk of death or bodily damage from collision (as in the case of raptor birds and migratory waterfowl) or interaction (as in the case of bats) with the turbines.

There is no Legally Protected Area, Important Bird Area or Ramsar Site within a 10 km radius of the project-area, the closest such areas being approximately 20-140 km away.

IX. Occupational Health and Safety

Occupational health and safety (OHS) refers to ensuing safety, health and welfare of people engaged in workplace. IFC Performance Standard 2 (Labour and Working Conditions) highlights the need for safe and healthy work environment taking into account inherent risks in its particular sector and specific classes of hazards with respect to a project, including physical, chemical, biological and radiological hazards, and specific threats to women. The PS emphasises the necessity to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards.

X. Air, Water and Soil Environment

Air Environment

Air Quality monitoring in the study area was conducted in the project area by a NABL accredited laboratory to evaluate the baseline conditions. The locations chosen for sampling are part of two different villages, identified in the project area. The Pooling Sub Station of Suzlon at Gadehothur village (AAQ-1) is the first sampling location and Vajrakarur village (AAQ-2) is the second location. Both these locations come under the category of residential zone and are chosen based on the direction of wind, habitation around etc.

The concentration of all the monitoring parameters (PM_{10}, $PM_{2.5}$, SO_2 and NOx) in the two regions – Gadehothur and Vajrakarur, is substantially below the National Ambient Air Quality Standards (NAAQS) prescribed by Central Pollution Control Board.

Water Environment

Water quality was analysed for a total of two locations as per IS 10500:2012 drinking water standards.

The water samples from sampling locations viz., Pottipadu Village pond water was found to be within permissible limit of CPCB standard. Also, water sample from Sathya Sai tap water of Vajrakarur Village was observed to be above the permissible limit of IS 10500:2012.

Soil Environment

Soil quality testing of the project location is conducted by NABL accredited Laboratory division of Eco Services India Pvt Ltd., for which samples were collected from Suzlon's Pooling Sub-station at Gadehothur village and from Vajrakarur village. The texture of soil in both the villages is silty clay. Presence of essential elements such as Sodium and Potassium are Below Detection Level (BDL)

XI. Potential Impacts and Mitigation

S.No.	Aspects	Potential Impacts	Suggested Mitigation/Management Measures
CONSTRUCTION PHASE			
1.	Land procurement; and Site Preparation	• Row for Transmission lines • Loss of ground vegetation	• Details of associated facilities, i.e. transmission line and access road shall be discussed with the locals from project villages and the local community; • It shall be ensured that the Land owners is provided with complete information about the

S.No.	Aspects	Potential Impacts	Suggested Mitigation/Management Measures
			project, including relevant details such as the lifespan of the project, its associated risks, impacts and benefits prior to sale agreements with them; • All sale/ lease deeds shall be in the local language (Telugu) and the land contributors shall not asked to provide on signatures on deeds in other languages such as English. • Re-vegetation shall be undertaken by MVIPL once the site preparation activities are over; • It shall be ensured that native vegetation species shall be planted; and • It shall be ensured that excavated areas shall be guarded properly which can otherwise lead to accidents. Suzlon shall also demarcate certain areas for grazing in order to prohibit animals straying into turbine locations and transformer yards during project operation. • Minimize presence of ancillary structures on the site by minimizing site infrastructure.
2.	Traffic Disturbance	Dust Emissions; Disturbance from traffic movement; Increased probability of road accidents	• Project transportation through community areas shall be avoided to the extent possible; • The routes for transport of construction material for road development shall be finalized conducting a survey of the existing road conditions; • The transportation of WTG components shall be avoided during peak traffic flow phases as identified during traffic volume survey; • Routes shall be planned along wider and less-restrictive roads. Where road widths are insufficient, either temporary widening of the road with gravel or full depth widening of the pavement structure will be undertaken; • Widening of shoulders and development of new roads will be discussed with the community and undertaken only after all concerns are addressed; • All vehicles engaged for transportation shall be verified for fitness and valid Pollution Under Control (PUC) certificates issued by registered authorities; • Any incidence of breakdown shall be attended immediately to ensure smooth flow of vehicle along the road. Movement of vehicle shall be restricted to the identified routes and only trained drivers shall be employed; • High noise generating construction activities shall not be carried out during night time; and • All public utilities like power transmission cables, telephone cables, water/sewerage lines, drains, tube wells etc. falling within road land width shall be inventoried, and arrange for relocation /shifting to adjacent areas in consultation with the respective agencies/authorities and community. • MVIPL will ensure implementation of the ***Traffic Management Plan*** for minimizing community disturbance due to WTG components and material

S.No.	Aspects	Potential Impacts	Suggested Mitigation/Management Measures
			transportation.
3.	Labour Engagement	Conflict among workers Use of community facilities	• Community expectations for employment and other local benefits need to be addressed and managed by the project proponent. • Regular updates on opportunities and skill requirements shall be provided to the community; • Assess the exact number of workers to be required at each stage in the construction period and notify the community about number of labourers and skills required; • The construction workers shall be instructed about their behaviour and interaction with the local community or other workers; • To the extent possible sourcing of construction labour (masons etc.) shall be done from local region; • Ensure local contracting and vendor opportunities as far as possible; • Avoid using any community infrastructure facilities like water bodies, electricity etc. • MVIPL shall ensure that the construction contractors engaged commit and adhere to social obligations including community relations, handling complaints and grievances, adherence to labour laws and international commitments etc.; • The contractor shall provide adequate training on social behaviour and community interaction to the workers engaged by them; • Health camps and awareness programs shall be conducted at regular intervals. Participation of local community members in such programs shall be ensured; • The water usage shall be monitored and controlled to minimise the wastewater generation; and • MVIPL shall ensure that no child labour, forced labour and non-discrimination, payment of wages, etc. are compiled to by the contractors;
4.	Noise Levels	Increased noise levels due to operation of heavy vehicles; Use of diesel generator sets may also lead to incremental noise	• Construction activities shall be planned in consultation with local communities (if required); • Adequate precautions and information will be provided prior to execution of blasting activity (if any); • Construction equipment will be maintained in good working order and properly muffled; • Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvers and enclosures; • Provision of rubber paddings/noise isolators at equipment/machinery used for construction; • Construction vehicles shall be well maintained and idling time will be minimized for vehicles when not in use; • Site workers working near high noise equipment use personal protective equipment (PPEs) to

S.No.	Aspects	Potential Impacts	Suggested Mitigation/Management Measures
			minimize their exposure to high noise levels.
5.	Ecology	• The construction activities may lead to loss of vegetation resulting in displacement of wildlife species. • Disturbance to local livestock population	• The site clearance for tower erection, access road and ancillary facilities shall be restricted to the necessary footprint area around WTGs. • No vegetation shall be removed from land which are not directly required for any construction activity. • Cutting or lopping of trees shall be avoided. Mature trees and standing dead trees shall not be cut or lopped under any circumstances. • The crane staging area, intervening areas, overhead clearance for suspended turbine components shall be planned. • Solid or liquid waste generated by the project, or by project-related activities, should not be allowed to contaminate soil, ground-water or surface water-bodies. • Areas around the turbine shall be rehabilitated at the earliest and emphasis should be given on increasing the green-cover in and around the project-site to ameliorate project-induced disturbances and enhance the ecological value of the area.
6.	Occupational Health and Safety	• Material handling and storage • Possible injuries associated with working at height (≥ 2m) • Electrical work injuries (eye injuries, shocks, burns, fires/explosion) Other occupational hazards	• All workers engaged in such work shall be provided with adequate Personal Protective Equipment (PPE) such as safety helmets, belts, safety shoes; • Effective work permit system for working at height shall be ensured; • Provision of Earth Leakage Circuit Breaker (ELCB) and Residual Current Circuit Breaker (RCCB) shall be ensured with power supply wherever possible as per design of protection system; • All lifting operation shall be carried out by a competent person certified in conducting such work. The contractor shall ensure that no person is engaged in driving or operating lifting appliances unless he is sufficiently trained, competent and reliable, possesses the knowledge of inherent risks involved in the operation and is medically examined periodically; • Loading and unloading operation of equipment shall be done under the supervision of a trained professional. • All work at height to be undertaken during daytime with sufficient sunlight. • The labour engaged for working at height shall be trained for temporary fall protection devices and use of personal fall arrest systems shall be ensured. • Fire extinguishing equipment shall be provided in adequate number on site to handle any possible fire outbreaks.
7.	Ambient Air Quality	• Dust generation and subsequent dispersal by wind during site preparation	• To avoid spillage during transit, fine-grained and loose construction materials should be covered; • Storage area of construction materials has to be in an area which is least wind-prone;

S.No.	Aspects	Potential Impacts	Suggested Mitigation/Management Measures
		activities; • Pollutant (SOx, Nox, PM) discharge into surrounding air from exhaust emission of construction vehicles.	• Vehicles are to maintained properly by conducting regular checks to minimise the emission of pollutants from exhausts and obtaining Pollution Under Control certificate from pollution control board on a periodic basis; • Idling time of vehicles should be minimised to the extent possible, to reduce burning of fossil fuel; • Daily inspection of construction site to check the effectiveness of the above mentioned activities.
OPERATION PHASE			
1.	Ecology	• Collision of birds/bats with wind turbines and meteorological towers • Birds/bats collision and electrocution from transmission lines	• The layout provides adequate spaces between each turbine for movement of birds which would reduce the potential for accidental collision; • Daytime visual markers shall be provided on any guy wires used to support towers to enhance visibility of the wires to birds; • Visibility enhancement objects such as marker balls, bird deterrents, or diverters shall also be installed along the transmission line to avoid avian collision; • Native vegetation must be planted or allowed to grow around the wind-turbines, such that their canopy screens potential prey on the ground from raptors flying overhead; • It is to be ensure that there is no formation of heaps of rocks or earthen mounds around the installed WTGs; • Appropriate storm-water management measure shall be implemented to avoid creating ponds which can attract birds and bats for feeding or nesting in the windfarm area; • It is recommended that a long-term programme, designed to monitor avifaunal activity with reference to wind-turbines, be instituted at the project-site.
2.	Noise Levels	• Noise resulting from Wind turbines • Noise from the transmission lines	• Increase in dense vegetation coverage around the said receptor point location which shall act as noise barrier; • Wind turbines shall be designed in accordance with the international acoustic design standards and maintained throughout the operational life so as to limit noise generation; • The wind turbines shall be maintained in good running conditions throughout the operational life of the project through routine maintenance; • Operation and Maintenance staff to be provided with personal protective equipment (PPEs) such as ear plugs and ear muffs when working close to turbine in operation; • It is suggested that ground vegetation such as shrubs and bushes are cleared to the minimum extent possible during site clearance activities; • Consult with the locals periodically to assess noise generation and set up a procedure to locate source of noise and steps taken to minimize them; and

S.No.	Aspects	Potential Impacts	Suggested Mitigation/Management Measures
			• Implement a complaint resolution procedure to assure that any complaints regarding operational noise are promptly and adequately investigated and resolved; • Undertake ambient noise level monitoring from NABL/MoEFCC accredited laboratories on an annual basis in order to understand the increase in noise levels due to the project operation; • The micro-siting guidelines recommended by National Institute of Wind Energy (NIWE), under the Ministry of New and Renewable Energy (MNRE), suggests wind farm developers to maintain a minimum distance of WTGs from sensitive receptors such as residential settlement/ house, highways, schools, religious structure, to ensure minimization of potential noise, shadow flicker and blade throw risks. Based on the formula, 143.5 m is the minimum distance between the project turbines (S-97, Suzlon make, HH of 90 m and RD of 97 m) and receptors. Therefore, Mytrah shall ensure the clearances as per the formula to adopt best Industry practices.
3.	Hazardous Waste and Soil Quality	• Waste oil will be generated from the turbine gear box • Improper disposal and handling of waste oil can lead to soil and ground water contamination	• Hazardous waste such as waste/used oil has to be stored in a defined space and should be accessible only to authorised personnel • The storage space should be an impervious paved surface and should have a secondary containment area and spill control toolkit • Quantity of hazardous waste handled should be clearly documented as per Hazardous Waste Management rules and documents should be updated regularly • Hazardous waste should be sold to an authorised vendor on a periodic basis, documents of which should be maintained.
4.	Water Resource and Quality	• Water required for toilet flushing is being sourced from the bore well at project site near the pooling substation	• Adequate septic tanks and soak pits should be provided at site • Septic tanks should be maintained properly and cleaned at regular intervals • It is advisable to get water for domestic usage through authorised water tankers • Since water in the region has high fluoride content, it is recommended to find an alternate source of drinking water for the personnel on site.
5.	Occupational health & safety	• Working at height during maintenance • Electrical hazards • Structural collapse due to natural hazards	• Only trained workers should be allowed to work at heights. • Workers handling electricity and related components will be provided with shock resistant gloves, shoes and other protective gears. • Implementation of work-permit system for working at height, electric and hot jobs. • Personal protective equipment to be provided for all personnel during maintenance work. • The switchyard building will be provided with fire extinguishers and sand buckets at all strategic

S.No.	Aspects	Potential Impacts	Suggested Mitigation/Management Measures
			locations to deal with any incident of fire. • Health and safety training is given on regular basis to all the employees
6.	Community/ Social Issues	• Alteration of Land Use • Visual Aesthetics • Shadow Flicker • Hindrance to communication facility	• MVIPL to apply and obtain change of land use from Agricultural land and Non-Agricultural (NA) for industrial purpose; and • The layout for access roads and transmission lines shall be developed considering the minimum land requirement as needed. • The vane tips of the wind turbine shall be painted with Orange colour strips to avoid bird hits; • Maintaining uniform size and design of turbines by having same direction of rotation, type of turbine and height on a wind farm or adjoining wind farm; • Layout or adjustment should be such that turbine blades rotate in the same direction; • Ensuring absence of any auxiliary structures except the required ones such as access roads and transformer yards which accompany the turbines; and • The micro-siting guidelines recommended by National Institute of Wind Energy (NIWE), under the Ministry of New and Renewable Energy (MNRE), suggests wind farm developers to maintain a minimum distance of WTGs from sensitive receptors such as residential settlement/ house, highways, schools, religious structure, to ensure minimization of potential noise, shadow flicker and blade throw risks. Based on the formula, 143.5 m is the minimum distance between the project turbines (S-97, Suzlon make, HH of 90 m and RD of 97 m) and receptors. Therefore, Mytrah shall ensure the clearances as per the formula to adopt best Industry practices. • Planting trees and ensure increase in dense vegetation coverage to screen the impacted receptor locations from sun; • Installation of blinds such as curtains at the concerned window facing the turbines; • It is recommended that MVIPL should ensure formulation of a complaint resolution procedure by Suzlon for the local community so that any issues or concerns associated with shadow flicker are reported to the site staff. Also, appropriate and timely action taken in case of receipt of such complaints need to be documented and maintained for records.

XII. Conclusion

Based on the ESIA study conducted and as per ***IFCs categorisation of project***, the proposed project can be categorized as ***Category B*** which specifies that the project can cause potential and limited

adverse social or environmental impacts which are generally site-specific, largely reversible and readily addressed through mitigation measures.

Also, as per ***ADB's Environment Categorization*** of Projects the proposed wind power project can be classified as a ***Category B*** for Environment as the project will have adverse environmental impacts that are less in number, generally site specific and readily addressed through mitigation measures. In addition, the project is also classified as ***Category C*** for Involuntary Resettlement and Indigenous People as no involuntary resettlement and indigenous people are anticipated to be affected by the project activities.

1. INTRODUCTION

Mytrah Energy Limited (MEL), formerly Caparo Energy Limited, is a public limited company incorporated in Guernsey. Mytrah Energy (India) Limited (herein after referred as 'MEIL'), with headquarters in Hyderabad, is the wholly owned subsidiary of MEL. MEIL has built a portfolio of over 500 MW of operating wind plants in India, with a further 100 MW in 2014. These assets are spread across ten wind farms in six states - Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu. The company aims to own and operate 5000MW of renewable power in India.

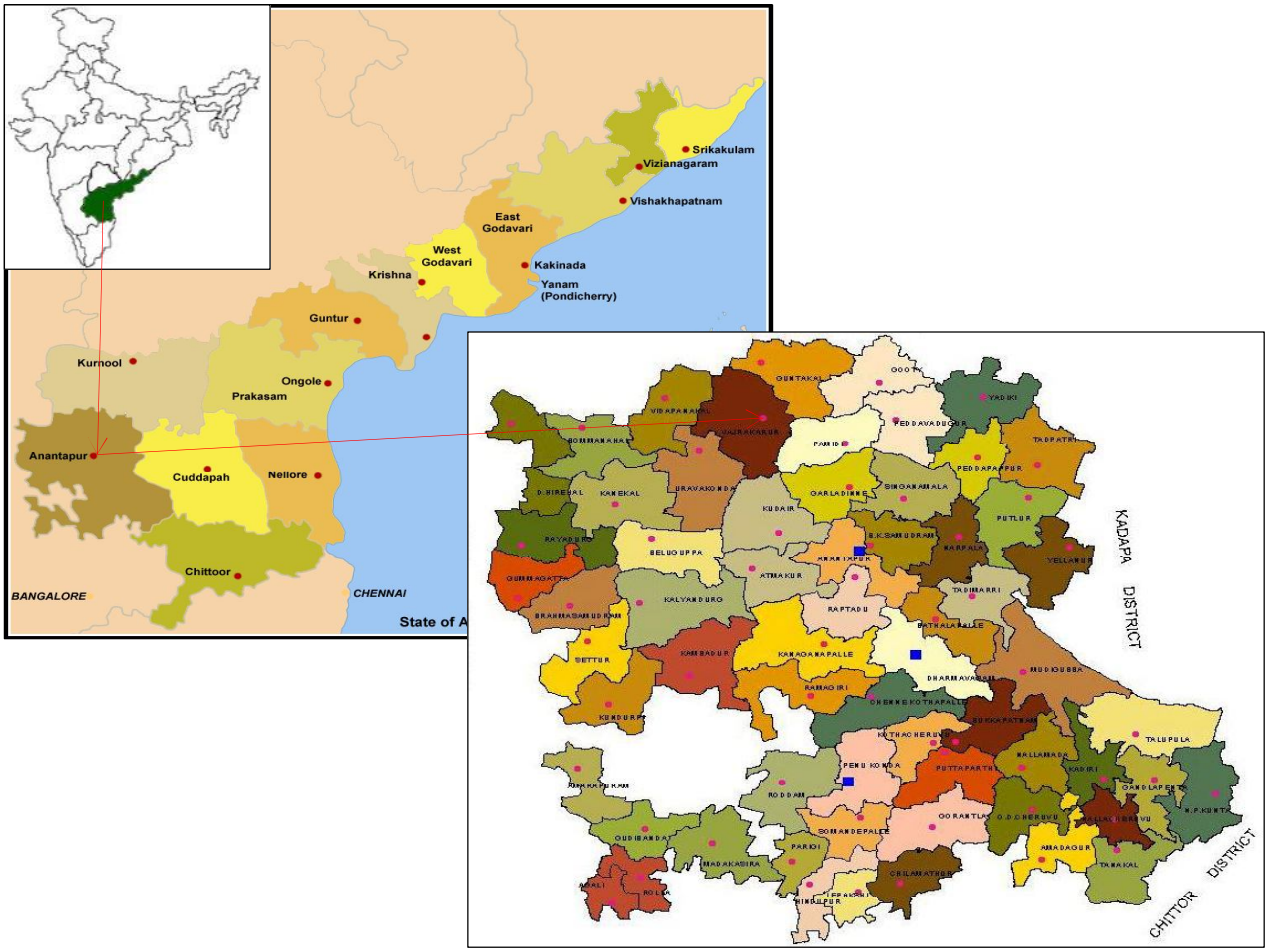
Mytrah Vayu Indravati Pvt. Ltd (herein after referred as 'MVIPL'), is a subsidiary of MEIL and intends to develop a 105 MW Wind Power Project in Vajrakarur Mandal, Anantapur District, Andhra Pradesh (herein after referred to as the 'Project'). The project envisages installation of 50 X 2.1 MW, Suzlon S-97 Wind Turbine Generators (WTG).

In order to ensure that the project is established in a manner that is socially responsible and reflects sound environmental management practices, MVIPL intends to carry out an Environmental and Social Impact Assessment (ESIA) study for the Project, in accordance with International Finance Corporation's (IFC) Performance Standards (PS) on Social and Environmental Sustainability, 2012; Environment, Health and Safety Guidelines, 2007 and Asian Development Bank (ADB) Safeguard Policy Statement (SPS), 2009. The aim of the study is to assess whether the project to comply with the requirements of the above mentioned guidelines as necessitated by financial investors. This ESIA report has been prepared on the basis of a reconnaissance survey, baseline environmental monitoring, review of secondary data and consultation with relevant stakeholders. Based on the requirements of the IFC PSs and ADB SPSs, adequate management plan and systems are also expected to be developed as part of this assessment.

1.1 Project Background

MVIPL intends to set up a 105 MW wind power project spread across private land procured from seven villages i.e., Tatrakallu, Vajrakarur, Gadehothuru, Pottipadu, Gulapalem, Konakondla and Kamalapadu of Vajrakarur Mandal, Anantapur District. The project will comprise of 50 WTGs with a rated capacity of 2.1 MW each. MEIL through its 100% owned project SPV, Mytrah Vayu Pennar Pvt. Ltd (MVPPL) has an operational 63 MW wind project in the vicinity of the proposed project site at Vajrakarur, at an aerial distance of 2 km.

Figure 1-1: Indicative Location of the project area



The associated activities for the project include:

- Installation of a Power Evacuation System: The power from the project will be transmitted to two different Substations;
- Construction of 14 km long double circuit 33 kV transmission line for evacuation of 39.9 MW power generated from 19 WTGs to the 132/33 kV Grid Substation at Guntakal of Transmission Corporation of Andhra Pradesh (AP TRANSCO); and
- Construction of 3 km long double circuit 33 kV transmission line for evacuation of 65.1MW power generated from 31 WTGs to the 132/33 kV Power Substation developed by Suzlon at Gadehothuru Village. Further, power will be transmitted to 220/11 kV Ragulapadu Grid Substation of AP TRANSCO situated at a distance of 5.3 km from substation developed by Suzlon.
- Construction of internal approach roads of about 55 Km long and 6 m width on private land.
- Internal transmission lines of 33 km in length will be constructed connecting all the WTGs and approximately 627 transmission poles will be installed.

For the development of the project, MEIL has engaged M/s. Suzlon Energy Limited (hereinafter referred as 'Suzlon') as the Erection Procurement and Construction (EPC) Contractor on turnkey

basis. Suzlon will be responsible for wind resource assessment, land procurement, obtaining necessary statutory approvals, supply, installation and commissioning of the project WTGs, construction of internal roads and transmission lines (internal and external). Thereafter, a separate contract will be executed for operation and maintenance of the project between MEIL and Suzlon. MEIL has entered into a comprehensive Business Partnership Agreement (BPA) with Suzlon Energy Ltd on 8th May 2010 for 3000 MW of installed capacity of wind power. The proposed project of 105 MW forms a part of the proposed capacity to be installed by Suzlon. Operations & Maintenance (O&M) Services for the project are proposed to be provided by Suzlon for a period of 20 years

1.2 Purpose and Scope

This study is being undertaken as per the requirements of the IFC Performance Standards to understand the Environmental and Social impacts associated with the proposed 105 MW Wind Farm Project. The study suggests appropriate mitigation measures and management plans to prevent and minimize all adverse impacts identified. The environmental and social assessment has been carried out against the following reference framework:

- The IFC Performance Standards for Environmental and Social Sustainability;
    - 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
    - Performance Standard 8: Cultural Heritage
- EHS Guidelines for Wind Energy, August 2015;
- The IFC General EHS Guidelines;
- ADB Safeguard Policy Statements; and
- Applicable Indian national, state and local regulatory requirements.

The scope of work for the entire ESIA study includes the following activities:

- Reconnaissance survey and primary site assessment to collect and review baseline environmental and social conditions;
- Generation of primary baseline environmental data including air quality, soil quality, water quality and noise quality;
- Collection of additional secondary environmental, social and demographic information;
- Collection of information on forestry, flora and fauna, and natural habitats and species of special conservation/scientific interest through ecological assessment of the study area;
- Consultation with local community, stakeholders and review of land acquisition and compensation process;
- Identification of social concerns and issues pertaining to land procurement;

- 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 (including associated facilities like, transmission line, access roads etc. as applicable) and developing mitigation measures and plans to maximize project benefits to the community;
- Preparation of an Environmental Management Plan (EMP) based on the EIA and development of 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 EIA.

1.3 Approach and Methodology

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

- A regulatory review was undertaken in order to understand the applicable, local and national legislation and regulatory frameworks.
- A detailed social and environmental assessment of site and surrounding areas was undertaken through:
    - Reconnaissance surveys to understand site specific issues;
    - Discussion with the local community and identification of key issues;
    - Baseline noise level data collection of the site through primary monitoring;
    - Ecological assessment on flora and fauna of the site and study area through primary and secondary surveys.
- Collation of secondary information on social aspect of the site through consultation with the local community to understand community perception with regard to the project and its activities.
- Assessment of impacts, including cumulative impacts, based on understanding of the project activities and existing baseline status.
- Preparation of Environment and Social Management Plan (ESMP).

1.4 Agencies Contacted

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

- Suzlon Energy Limited;
- Mytrah Energy India Limited;
- Eco Services India Private Limited;
- Survey of India;
- Census of India; and
- Rural Development Trust of India, an NGO

1.5 Limitations of the Study

The ESIA study for the Project is largely based on the documents made available, discussions with community and observations from the site survey conducted. Professional judgement and subjective interpretation of facts has been applied for this study. All information's and inferences presented herein are based on the specifics currently available within the limits of the scope of work, information provided by the client or its representative, existing secondary data, budget and

schedule. ***During the site survey, it was reported that Suzlon is in the process of identifying and finalising the WTG locations for Nine (9) project turbines namely, PPD 63, PPD 64, PPD 61, PPD 60, PPD 52, PPD 80, PPD 53, PPD 54 and PPD 50. Hence, site settings, environmental and social sensitivity at these locations could not be verified at the time of site visit.***

1.6 Report Structure

The full report presents the findings, analysis and recommendations for the proposed project which have been provided by environmental and social impact assessment (ESIA) team.

Chapter 1 - Introduction
The section provides description of project background, objectives, scope and organization of the study and approach & methodology.

Chapter 2 – ESIA Process and Methodology
This chapter provides an overview of process adopted for performing ESIA study like site visit, land use mapping, stakeholder engagement and baseline environmental monitoring. It also provides a brief about impact assessment and evaluation criteria.

Chapter 3 - Project Description
This section deals with project details encompassing layout, land details, site settings, project components etc. This also deals with the infrastructural development as a part of project during construction and operation phase and resources required.

Chapter 4 – Legal, Policy and Administrative Framework
This section provides information on Policy, Legal and Administrative framework applicable to the proposed wind project. The Section defines applicability of IFC Performance Standards of the proposed project.

Chapter 5 – Analysis of Alternatives
This chapter presents the analysis of alternatives for the proposed wind project considering no project scenario, alternate methods for power generation and technology and alternate routes for transmission line.

Chapter 6 – Socio-Economic Environment
This Section presents socio-economic profile of the study area based on primary and secondary information on socio-economic aspects of the study area. This chapter also presents stakeholder identification process for the project, details of consultations held with key questions and responses extracted from the survey undertaken during site visit. Impact assessment and mitigation measures for construction and operation phase have also been detailed out. Results of shadow flicker modelling have also been presented.

Chapter 7 – Noise Environment
This Chapter presents the noise levels prevailing in the study area and identified noise receptors. Noise modelling has been undertaken using EMD's WindPRO v2.7 software. Impacts generated from

increased noise during construction and operation phase has been assessed and mitigation measures for same have been provided.

Chapter 8 – Ecological Environment
This Chapter provides the details of the baseline conditions, potential effects of the proposed wind power project on flora and fauna on the ecological receptors. Specific mitigation measures have also been recommended for managing the identified impacts have also been detailed.

Chapter 9 – Occupational Health & Safety Environment
This Chapter of the report identifies the possible occupational hazards associated with the construction and operation of the proposed project and suggests appropriate mitigation measures that should be taken in order to prevent and/or minimize the impact of such hazards.

Chapter 10 – Air, Water & Soil Environment
This Chapter illustrates the baseline settings of the land, air and water environment in the Project area, the potential impacts on them associated with the construction and operation of the Project and suggests specific mitigation measures to avoid/reduce the identified impacts.

Chapter 11 – Environmental and Social Management Plan (ESMP)
This Section provides recommendation for environmental and social management plan aimed at minimizing the negative environmental and social impacts of the project. Environmental and social monitoring requirements for effective implementation of mitigating measures during development as well as operation of the project have also been delineated along with requisite institutional arrangements for their implementation.

Chapter 12 – Conclusion and Categorization of the Project
This chapter encompasses category assigned to the proposed wind project based on IFC Categorization. A brief conclusion drawn from the impact assessment study has also been presented.

List of Annexures

Annexure I - Copy of Social Perception Survey Questionnaire
Annexure II - Detailed Report on Noise Model Results
Annexure III – Copy of AP Wind Power Policy - 2015

2. ESIA PROCESS AND METHODOLOGY

2.1 Introduction

This section presents the approach and methodology adopted for carrying out the Environment and Social Impact Assessment (ESIA) study for the proposed wind power project. A brief overview of the methodology has been presented below:

- A regulatory review was undertaken in order to understand the applicable, local and national legislation, policy and regulatory frameworks;
- A detailed social and environmental assessment of site and the surrounding areas were undertaken through:
    - Reconnaissance surveys for all the turbine locations to understand site specific issues;
    - Discussion with the local community in the project villages to understand their perception about the project and identification of key issues pertaining to similar projects in the region;
    - Baseline data collection for air, water, soil quality and ambient noise level in the Project area through primary monitoring; and
    - Ecological assessment for the project area through primary and secondary surveys.
- Collection of secondary information on social aspects of the site through consultation with the local community to understand the community perception with regard to the project and its activities;
- Assessment of impacts, including cumulative impacts, based on understanding of the project activities and existing baseline status; and
- Preparation of Environment and Social Management Plan (ESMP).

Table 2-1: ESIA Approach and Methodology

S. N	Methodology	Activities conducted
1.	Regulatory Review	• Desktop study of applicable national and local legislations; • Review of requirements under IFC Performance Standards, IFC's EHS General Guidelines for Wind Energy and ADB SPS.
2.	Environmental appraisal of site	• Reconnaissance survey; • GIS mapping and analysis; • Baseline environmental monitoring covering : ➢ Ambient Noise; ➢ Ambient Air; ➢ Soil Quality; ➢ Water Quality; and ➢ Traffic Monitoring
3.	Ecological Survey	• Primary ecological survey of the project area; • Desktop review of secondary literature.
4.	Social Appraisal of site	• Social perception survey and consultation; • Questionnaire survey/Informal interviews; and • Analysis of district and village level Census data.

2.2 Regulatory Review

A desktop study was carried out to identify the national and local environmental and social legislations applicable to the proposed project. The requirements as per IFC's Performance Standards; Environment, Health and Safety (EHS) General Guidelines, EHS guidelines for Wind Energy, August 2015, ADB SPS (2009), Gender Policy requirements and ADB's Operations Manuals on safeguards and social protection have also been identified.

2.3 Environmental and Social Appraisal of the site

An environment and social appraisal of the site was undertaken during site visits to understand the site settings, observe the land use pattern, and identify receptor locations for noise and shadow flicker assessment and to establish the existing environmental status for ambient air, soil, water, noise and ecology in the study area. The villages from which private land is being procured were defined as the project villages. Information regarding the socio-economic profile of the project influenced villages and perception of the community about wind power projects were also collated.

2.3.1 Reconnaissance Survey

A reconnaissance survey of 41 WTGs locations and associated facilities such as pooling substation was carried out by a three member team from AECOM from 25th to 28th August, 2015. Remaining Nine (9) WTGs locations and associated facilities were not verified by AECOM as the locations are yet to be finalized. The survey focussed on evaluation of existing land use of the site, its surroundings, identification of receptors such as settlements/households and culturally important sites such as temples, mosques etc located in and around the Project area. Details of existing wind farm owned by MVIPL in the surrounding area were also gathered to establish the baseline in the area.

2.3.2 GIS Mapping and Analysis

Based on the geographic coordinates of the Project area, the satellite imagery were geo-registered and geo-referenced with respect to the bench marks and limited control points from GPS. 2nd order polynomial transformation was used to achieve higher accuracy in geo-referencing.

Satellite images of land use and land cover were processed in ERDAS Imagine - a remote sensing application with raster graphics editor abilities designed by ERDAS for geospatial applications using unsupervised classification technique. Major land use classes have been delineated as agriculture land, fallow land, barren land, settlements, forest area, water body, canal and river. The digital classified map was verified for the accuracy assessment for major land-use classes present in the study area and land use land cover map has been finalized.

2.3.3 Baseline Environmental Monitoring

For assessing the baseline status of the environment, primary monitoring of ambient air quality, water quality, soil quality and noise levels was carried out. The monitoring locations were identified within the study area based on factors such as representative nature of the location, land use, accessibility and availability of power, topographical and meteorological factors. The collection and

analysis was carried out by the laboratory division of Eco Services India Pvt Ltd, which is accredited to National Accreditation Board for Testing and Calibration Laboratories (NABL).

Ambient Air Quality

Two (2) locations for ambient air quality (AAQ) monitoring were identified in the Project area during the site survey. Four samples each are collected on four different days from both the locations and sampling is done for duration of 24 hours. The details of the AAQ monitoring are presented in ***Chapter 10.***

Baseline Water Quality Monitoring

Two water samples were collected from the Project area for evaluation of water quality as per IS 10500:2012 standards. Both the samples are from surface water bodies and are examined as per the standard methods specified by American Public Health Association (APHA 22nd edition) and Bureau of Indian Standards (BIS). The details of water quality monitoring are presented in ***Chapter 10.***

Baseline Soil Quality Monitoring

During site survey, two (2) locations were identified for collection of soil sample in order to evaluate soil quality in the region. The soil sample was tested for physical and chemical quality and its details have been furnished in ***Chapter 10.***

Baseline Noise Monitoring

During the field survey, four potential noise receptor locations were identified in the Project area and 24 hours continuous ambient noise monitoring was carried out at all these receptor locations. The details of the noise monitoring results are presented in ***Chapter 7.***

2.3.4 Ecological Survey

A phased approach has been followed to carry out the ecological assessment for the proposed project. Successive phases of the assessment include (i) Reconnaissance survey (ii) Onsite data collection for determining ecological baseline setup (iii) Secondary data collection through desktop review of available literature (iv) Identification, prediction and evaluation of impacts and possible mitigation. The details have been presented below:

Onsite Data Collection

Flora

Primary data on the flora of the study area was generated through quadrat-based quantitative surveys at identified nine sites. At all nine locations quadrate study was conducting by marking a quadrat of approximately 20 m x 20 m for counting the number of tree species as well as the number of individuals of each species, falling within the quadrate;

Similarly a quadrat of approximately 5 m x 5 m for counting the species of shrubs and quadrats of 1 m x 1 m to note the herbaceous data was marked with the bigger quadrate and number of individuals of each species was noted respectively; and

The data recorded through the quadrat-based quantitative surveys was analysed to estimate the percentage frequency, abundance and density of each floristic species. Species richness was calculated, separately for the woody and non-woody plant. Following formulae were used for calculating the percentage frequency, abundance and density, as applicable, of the species identified in the nine quadrats studied:

$$\%\ \text{Frequency of species A} = \frac{\text{Number of quadrats of occurrence of species A}}{\text{Total number of quadrats studied}} \text{x } 100$$

$$\text{Abundance of species A} = \frac{\text{Number of individuals of species A in total quadrats studied}}{\text{Number of quadrats of occurrence of species A}}$$

$$\text{Density of species A} = \frac{\text{Number of individuals of species A in total quadrats studied}}{\text{Total area studied}}$$

Fauna

Primary data on the fauna of the study area was generated through both, direct evidence in the form of visual sightings and indirect evidence such as calls, nests, burrows, droppings, scats, moults, tracks, etc. was observed in course of a brief walk-over of the site;

Following the walk-over, the site was scanned with standard bird-watching binoculars for approximately fifteen-minutes to record bird-species in particular;

The survey was conducted during most of the diurnal faunal activity-period, from mid-morning till early evening. Due to time and resource constraints and given the preliminary nature of this survey, the emphasis of the studies was kept limited to the higher and diurnal fauna; and

In view of the known vulnerability of certain faunal groups mainly avifauna and bats; amongst mammals to wind-farm impacts, a special focus was given on these during the survey.

The survey was focussed on evaluating existing land use of the site and its surroundings, vegetation structure. Based on the survey nine sites were identified within the project area as ecological survey locations for ecological study such that, they represented the different habitat and associated land-use types. The details have been furnished in ***Chapter 8*** of the report.

Secondary Data Collection

Extensive desktop review of available published literature (books, websites, scientific papers, articles etc.) was conducted. The Forest Working Plans of the Forest Divisions falling in the project area was referred to for collation of secondary information. Project proponent, governmental institutions and local residents of the survey-area were also consulted for gathering of information. The secondary data was appropriately supplemented by field survey and primary data collection.

2.3.5 Social Perception Survey and Consultation

Social perception survey and consultations were undertaken by AECOM team to appraise the socio-economic status of the project villages, livelihood pattern and the existing village amenities. The findings of the survey and consultations are primarily based on the questionnaire survey regarding the baseline socio-economic status of the villages and informal interviews on the perception of the

community about the proposed project and wind power projects in general. Discussions were also carried out with the land aggregator and a few land owners including women to understand the land procurement process and compensation rates offered. The approach adopted for the social perception survey and consultation included the following;

- Identification of the relevant stakeholders including individual land owners and local villagers residing in the project villages;
- Assessment of the baseline socio-economic status of the villages, the perception of the community about wind power projects in the region, existing land use of the land sold for the project, and land rates/compensation paid to the land owners; and
- Understand the concerns and aspirations of the community through survey and discussions in their local language.

To consult with the land owners of the private land identified for the proposed project, a formal meeting was arranged by Suzlon on 26th, August 2015. Furthermore, a meeting was also held with the Land Aggregator, M/s. Chella, who was responsible for land procurement and obtaining necessary statutory approvals required for the project. He discussed and explained the procedure adopted for procurement of private land.

2.4 Impact Assessment

The assessment of impacts during the construction, operation and decommissioning of the Project has been carried out by developing an impact evaluation and significance criteria. The first step of the Impact Assessment involved identification of impacts based on the review of available project information; discussions with the local community; representatives of the project proponents and other sector specific professionals. The assessment of impacts has been carried out based on the range of potential impacts and extent of their severity on environment, ecology, socio-economic resources, demographics, livelihoods, as well as access and infrastructure issues. Mitigation measures for the identified impacts have also been proposed.

2.4.1 Impact Evaluation Criteria

The criterion which has been used to appraise impacts on various environmental and social aspects are presented in the Table below:

Table 2-2: 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. For transmission line when the impact is restricted within the right of way	except for ecology (which is defined as loss of vegetation only at site) or within the base of pylon and under the conductors
	Medium Spread	Impact is spread up to 2 km from the boundary of the Project area or within 500 m on either side of	except for ecology (which is defined as loss of vegetation at site including large trees with limited disturbance to

Criteria	Sub-Classification	Defining Limit	Remarks
		transmission line	adjoining flora & fauna)
	High spread	impact is spread up to 2 km to 5 km from boundary of the Project area or beyond 500m on either side of transmission line	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 1 year;	the anticipated recovery of the effected environmental component is within 2 years
	Medium Duration	when impact extends up to 3 years;	With an anticipated recovery of the effected environmental component is within 6 years
	Long Duration	when impact extends beyond 3 years;	with anticipated recovery of prevailing condition to happen within 6 years or beyond or upon completion of the project life
Intensity: defines the magnitude of Impact	Insignificant intensity	when resulting in minimal changes in the environmental baseline conditions;	However, it shall be reconsidered where the baseline values are already high.
	Low intensity	when resulting in changes in the baseline conditions in the immediate surroundings	for ecology it refers to minimal changes in the existing ecology in terms of their reproductive capacity, survival or habitat change
	Moderate intensity	when resulting in changes in the baseline conditions alter the baseline conditions in the surrounding area	for ecology, it refers to changes that are expected to be recoverable
	High intensity	when change resulting in the baseline conditions are significantly modified	While for ecology, high intensity refers to changes that result in serious destruction to species, productivity or their habitat.
Nature: refers to whether the effect is considered beneficial or adverse	Beneficial	-	Useful to Environment and Community
	Adverse	-	Harmful to Environment and Community

2.4.2 Impact Significance Criteria

A significance assessment matrix was developed to assess the impact based on the appraisal criteria developed above which is as given in the Table below:

Table 2-3: Impact Significance Criteria

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

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

2.4.3 *Formulation of Environment and Social Management Plan*

An Environment and Social Management Plan (ESMP) has been developed for the project based on the impacts identified. The ESMP provides economically feasible control technologies and procedures to minimize any impact on environment and mechanism for continuous consultation and involvement of the community throughout the various stages of the project.

3. PROJECT DESCRIPTION

3.1 Introduction

This chapter describes the site settings of the project, project components and its requirements such as land and other associated project facilities. It elaborates on the various project phases along with its implementation schedule and mechanism.

3.2 Project Layout

The wind power project comprises 50 WTGs of Suzlon make, S-97 model (rotor diameter of 97 m and hub height of 90m and tubular tower) of 2.1 MW rated capacity totalling to 105 MW. WTGs are spread across seven (7) villages situated in Vajrakarur Mandal of Anantapur District,Andhra Pradesh. The project is currently in preliminary construction phase. Suzlon is the Erection, Procurement and Construction (EPC) Contractor for the project and will be responsible for all activities from procurement of WTGs to commissioning of the entire project.

The site is spread across a length of about 10 km along the North to South direction and about 10 km along the West to East direction. All the turbines are spread in a radial manner, forming four clusters. First cluster comprising of 9 WTGs is located in west direction of *Handri-Neeva Sujala Sravanthi* (HNSS) Canal, near Pottipadu village. Second cluster consisting of 10 WTGs is established in east direction of canal. Third cluster with 10 WTGs are spread out in a linear pattern in west of SH-26 (Vajrakarur village road). Fourth cluster with rest of WTGs are dotted around Kamalapadu village in east of SH-26. Table below presents the geographical coordinates of WTGs and surrounding locations as observed during the site survey.

Table 3-1: Geographical Coordinates of Proposed WTGs

S.No.	Turbine ID	Coordinates (As observed during site survey)		Land Type	Village Name	Site Settings
		Latitude	Longitude			
1	PPD-40	15° 0'5.19"N	77°21'55.49"E	Private Land	Tatrakallu	The site was covered with black soil, sun flower fields situated adjacent to the site
2	PPD-06	15° 0'48.84"N	77°19'48.93"E	Private Land	Gadehothuru	The site was covered with black cotton soil
3	PPD-05	15° 0'59.79"N	77°19'36.53"E	Private Land	Gadehothuru	Barren land with patches of dry grass and bushes
4	PPD-01	15° 2'1.10"N	77°19'18.40"E	Private Land	Gadehothuru	The site was covered by black soil and no settlement in the surroundings
5	PPD-15	15° 2'55.13"N	77°19'44.07"E	Private Land	Pottipadu	The site is flat with agriculture being practiced in the vicinity of the location
6	PPD-33	15° 1'56.30"N	77°21'23.80"E	Private Land	Vajrakarur	The site was covered with black soil and plain topography
7	PPD-27	15° 3'8.31"N	77°19'39.51"E	Private Land	Gulapalem	The site was covered with black soil and plain topography
8	PPD-12	15° 2'7.90"N	77°20'28.50"E	Private Land	Pottipadu	The site was plain with black soil. HNSS canal is located towards west of turbine

S.No.	Turbine ID	Coordinates (As observed during site survey)		Land Type	Village Name	Site Settings
		Latitude	Longitude			
						location
9	PPD-32	15° 2'9.70"N	77°21'14.10"E	Private Land	Vajrakarur	The site was located on a base of a small hillock
10	PPD-16	15° 2'19.81"N	77°19'21.09"E	Private Land	Pottipadu	The site was covered with black soil and plain topography
11	PPD-28	15° 2'55.27"N	77°19'59.41"E	Private Land	Gulapalem	The site was clear of all vegetation and covered with black soil
12	PPD-62	15° 1'31.60"N	77°23'42.80"E	Private Land	Vajrakarur	The site is located in a castor field, with plain topography
13	PPD-44	15° 1'55.91"N	77°22'28.55"E	Private Land	Vajrakarur	The site was covered with black soil with plain topography
14	PPD-14	15° 2'39.10"N	77°19'43.30"E	Private Land	Pottipadu	The site was covered with plain black soil
15	PPD-13	15° 2'21.00"N	77°20'26.60"E	Private Land	Pottipadu	The site was covered with plain black soil, a natural rain-fed stream was observed in south direction at a distance of 260m.
16	PPD-58	15° 2'52.30"N	77°22'55.80"E	Private Land	Vajrakarur	The site was covered with black soil; SH 26 is located in east direction of turbine location at a distance of 100m.
17	PPD-85	15° 4'2.90"N	77°24'21.90"E	Private Land	Kamalapadu	The site was covered with red soil, and plain terrain
18	PPD-78	15° 3'37.30"N	77°23'41.70"E	Private Land	Kamalapadu	The location is covered with black soil and situated at a distance of 800 m from Kamalapadu Village
19	PPD-84	15° 4'19.10"N	77°24'26.20"E	Private Land	Kamalapadu	The site is covered with red soil with a undulating terrain
20	PPD-34	15° 1'39.00"N	77°21'10.20"E	Private Land	Vajrakarur	The site is covered with black soil, a small temple is located in south-west direction at a distance of 116 m.
21	PPD-76	15° 3'1.70"N	77°24'31.00"E	Private Land	Kamalapadu	The site is located in a castor field, with plain topography
22	PPD-73	15° 2'6.90"N	77°24'31.80"E	Private Land	Vajrakarur	The site is located in a groundnut field, with plain terrain
23	PPD-74	15° 2'29.70"N	77°24'36.70"E	Private Land	Vajrakarur	The location is situated in black soil and surrounded by groundnut fields
24	PPD-75	15° 2'46.40"N	77°24'26.60"E	Private Land	Kamalapadu	The turbine location is situated in black soil and surrounded by groundnut fields
25	PPD-77	15° 3'21.60"N	77°23'42.00"E	Private Land	Kamalapadu	The location is covered with black soil and located at a distance of 900m from Kamalapadu Village
26	PPD-46	15° 2'38.90"N	77°21'52.70"E	Private Land	Vajrakarur	The site is covered with black soil; a small temple is located at a distance of 230m in south direction

S.No.	Turbine ID	Coordinates (As observed during site survey)		Land Type	Village Name	Site Settings
		Latitude	Longitude			
27	PPD-45	15° 2'24.70"N	77°22'5.60"E	Private Land	Vajrakarur	The site is covered with red soil; with a plain terrain
28	PPD-35	15° 1'16.40"N	77°21'11.80"E	Private Land	Vajrakarur	The site is covered with black soil; with a plain topography
29	PPD-11	15° 1'55.86"N	77°20'36.15"E	Private Land	Pottipadu	The site was plain with black soil. HNSS canal is located towards west of turbine location, at a distance of 900m.
30	PPD-47	15° 2'53.60"N	77°21'58.60"E	Private Land	Vajrakarur	The site is covered with black soil; with a plain topography
31	PPD-57	15° 3'12.10"N	77°22'19.60"E	Private Land	Vajrakarur	The site is covered with black soil; with a plain topography
32	PPD-56	15° 3'23.20"N	77°22'8.80"E	Private Land	Vajrakarur	The site is covered with black soil; with a plain topography
33	PPD-55	15° 3'36.40"N	77°22'0.30"E	Private Land	Gulapalem	The site is covered with black soil; with a plain topography
34	PPD-30	15° 2'36.55"N	77°20'28.46"E	Private Land	Vajrakarur	The site is covered with black soil; with a plain topography
35	PPD-82	15° 4'45.20"N	77°22'41.50"E	Private Land	Gulapalem	The site is an agricultural land comprising of black soil
36	PPD-81	15° 4'23.70"N	77°22'40.80"E	Private Land	Gulapalem	The site is covered with black soil, 2-3 trees were observed to be present towards north of the location
37	PPD-29	15° 3'1.27"N	77°19'50.18"E	Private Land	Vajrakarur	The site comprises black soil, and is located in west of the HNSS canal
38	PPD-02	15° 1'34.30"N	77°18'58.06"E	Private Land	Gadehothuru	The site is covered with black soil, with plain topography.
39	PPD-31	15° 2'27.19"N	77°20'42.28"E	Private Land	Pottipadu	The site is covered with black soil, with plain topography.
40	PPD-42	15° 1'21.30"N	77°22'28.11"E	Private Land	Vajrakarur	The site is covered with black soil; Vajrakarur village is located in east direction at distance of 400m.
41	PPD-43	15° 1'37.54"N	77°22'28.39"E	Private Land	Vajrakarur	The site is covered with black soil; Vajrakarur village is located in south-east direction at distance of 600m.
42	PPD-63, PPD-64, PPD-61, PPD-60, PPD-52, PPD-80, PPD-53, PPD-54, PPD-50	-	-	-	-	-

Note: *Locations of Wind Turbine No PPD 63, PPD 64, PPD 61, PPD 60, PPD 52, PPD 80, PPD 53, PPD 54 and PPD 50 is in the process of identification and finalization.*

Source: AECOM Site Survey

3.3 Site Settings

The project site is located approximately 40km North-West from Anantapur city and 9 km south of Guntakal Town. The site is accessible by State Highway (SH) 26 which connects Konakondla and Vajrakarur villages. The project turbine locations consist of agricultural and fallow land (rain-fed agricultural land) with occasional agricultural activities during monsoons. The locations identified are at an elevation of 450-465m above mean sea level (amsl). The site is majorly characterised by plain terrain with prevalence of black and red soils covered with few shrubs and trees at some of the locations. Crops species such as castor (*Ricinus communis*), Sunflower (*Helianthus annuus*), and ground nuts (*Arachis hypogaea*) were sown in the land identified for installation of WTGs.

The surrounding area comprises of agricultural lands and scattered villages which indicates a rural setup. Water is a scarce resource in the area and no major lakes or ponds were observed in the region except a surface water body *'Satya Sai Reservoir'* ,located at a distance of 2.8 km from WTG No. PPD 82 and a pond in *Pottipadu village,*located at a distance of 500 m from PPD 01. *Handri-Neeva Sujala Sravanthi* (HNSS) Canal is situated towards west of the project site, WTG No PPD 28 being the nearest located at a distance of 100m in east direction from the canal. A material yard is also located in Vajrakarur village, adjacent to SH-26 connecting Vajrakarur village and Uravakonda village. The site has scanty vegetation which is used by the community for grazing livestock. No ecological sensitive area is located within 5 km radius of the project area. Map below shows the physical features of the proposed project.

Photo 3-1: View of Location no PPD 13 which was observed to be excavated at the time of site visit

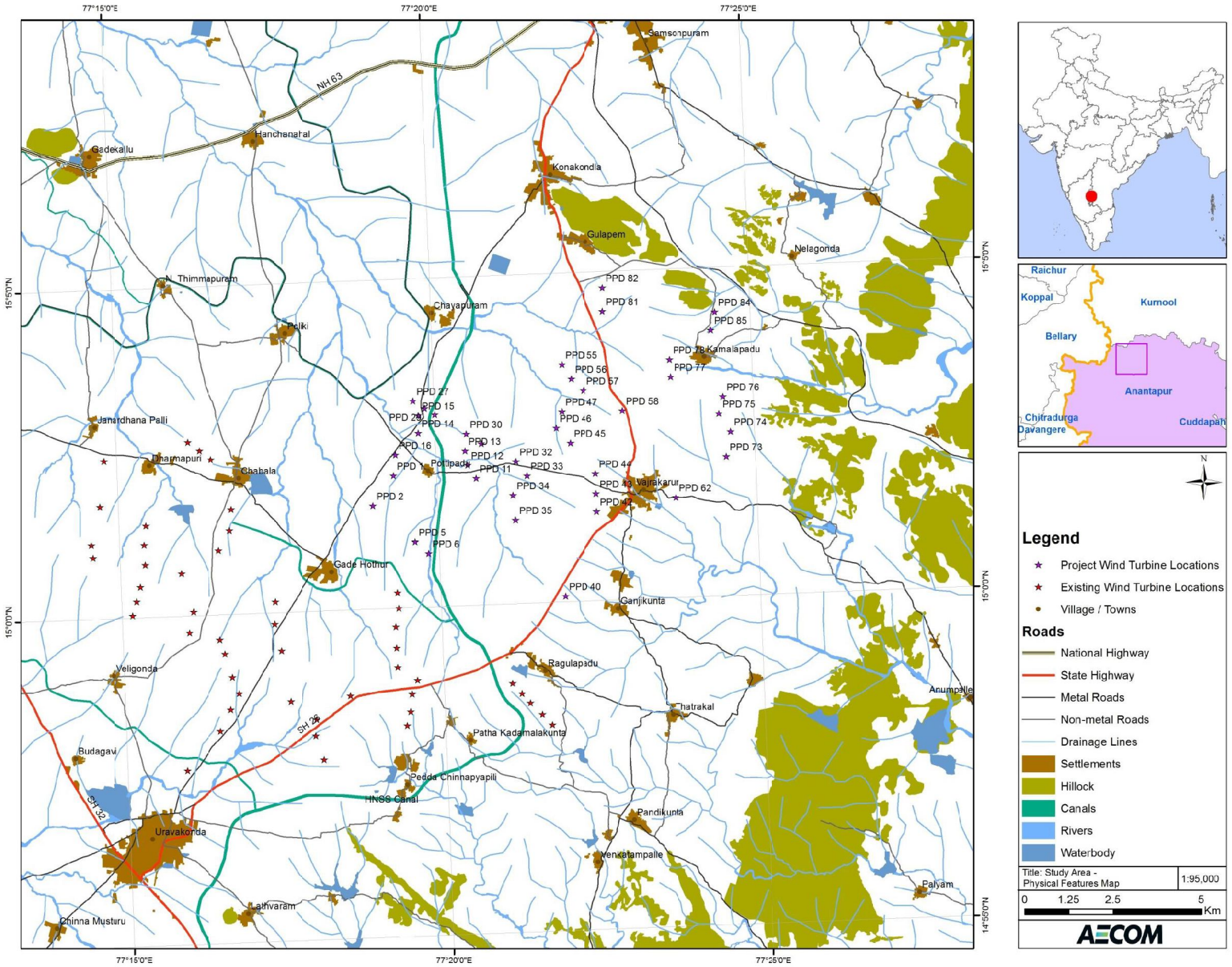
Photo 3-2: Reinforcement works for location no PPD 82

Photo 3-3: View of *Mooram access road* near WTG location no PPD 63

Photo 3-4: A view of material yard owned by Suzlon at Vajrakarur Village

Source: AECOM Site Survey

Figure 3-1: Physical Feature Map of the project area



3.4 Project Components

This sub-section outlines the technical details and design elements of the proposed project in brief. The wind farm comprises of the Wind Turbine Generators, a pooling sub-station and transmission facilities. The associated facilities include access roads and operation and maintenance facilities.

3.4.4 Wind Turbine Generators

The proposed wind farm comprises of turbines of Suzlon make 2100 kW-S97 model of 2.1 MW rated capacity having a rotor diameter of 97 m and hub height of 90 m. Each wind turbine[1] consists of three major mechanical components: tower, nacelle, and rotor. These are as described below:

Rotor

The rotor consists of three fibre glass blades that extend out of the hub. The rotor is mounted to a driveshaft within the nacelle (as defined below) to operate upwind of the tower. The rotor attaches to the drive train emerging from the front of the nacelle. Hydraulic motors within the rotor hub feather each blade according to the wind conditions, which enables the turbine to operate efficiently at varying speeds. The rotational speed of the rotor is controlled by blade pitch control. Pitch control helps in lowering the peak loads during high windy conditions.

Nacelle

The nacelle is a large housing that sits on top of the tower behind the rotor. It houses the main mechanical components of the wind turbine: drive train, yaw system and its accessories, etc. The nacelle is externally equipped with anemometer and a wind wane that signals wind speed and direction information to an electronic controller. The nacelle is mounted over yaw gear, which constantly positions the rotor upward of the tower.

Safe & efficient nacelle design features improved ventilation for better air cooling within the nacelle and an on-board crane for ease of maintenance, thus achieving higher reliability and machine availability. Four yaw drives enable enhanced control, balancing and load sharing, making the S97 turbine more stable and responsive.

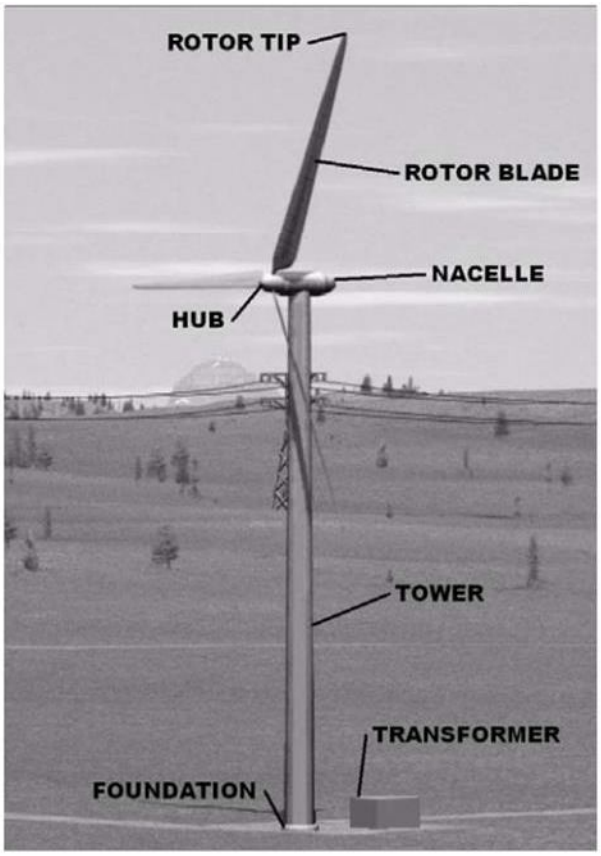
Tower

The tower supports the nacelle and rotor. The hub height of the S-97 towers is 90m. The towers are tubular and made of steel. The towers have an access door and an internal safety ladder to access the nacelle.

The major components of the turbine as mentioned above are shown in the Figure below:

[1] Wind Energy Siting Handbook February 2008, American Wind Energy Association

Figure 3-2: Wind turbine components



Source: IFC EHS Guidelines on Wind Energy, August 2015

3.4.5 Technical Details

The key technical details of the wind turbine generators are as provided in the Table below:

Table 3-2: Technical Details of the WTGs

S.No.	Technical Specifications	2100kW-S97 model
A.	**OPERATING DATA**	
	Turbine Model	S97-2.1MW
	Rated Power	2.1 MW
	Cut in Wind Speed	3.5 m/s
	Rated Wind Speed	11 m/s
	Cut out Wind Speed	25m/s
	Hub Height	90m
	Wind Class	IEC IIIA
	Rotor Speed	12.0 to 15.5 rpm (up to 18 rpm dynamically)
B.	**ROTOR**	
	Pitch System	Pitch regulated, electrical
	Diameter	97.0 m
	Swept Area	7386 m^2
	Rotor Orientation	Upwind
	Blade Material Type	Glass-fibre reinforced plastic (GRP)/Polyester
C.	**GENERATOR**	
	Type	Asynchronous 3 phase induction generator with slip

S.No.	Technical Specifications	2100kW-S97 model
		rings operated with rotor circuit inverter system (DFIG)
	Rated Power	2100 kW
	Rated Voltage	690 kV
	Frequency	50 Hz
	Damping Ratio	1128 Nm/rpm
	Protection	IP 54, (slip ring IP23)
	Cooling System	IC6A1A6 (as per IEC 60034-6), air cooled; forced air-air cooled
	Thermal Classification	Class H
	Max. rotor slip	20%
D.	**BRAKING SYSTEM**	
	Aerodynamic Brake	Pitch/full blade
	Mechanical Brake	Hydraulic disc brake, activated by hydraulic pressure (active brake)
E.	**GEARBOX**	
	Type	1 planetary stage, 2 helical stages
	Ratio	1: 98.8 (±0.5%)
	Mechanical Power	2.250 kW
F.	**YAW SYSTEM**	
	Drives	4 Electric motors with brake, gear box and pinion
	Bearings	Friction bearing with gear and Automatic lubrication system
	Speed	21.8 °/min
	Voltage (phase to phase)	3X690 V
	Power Consumption	15.00 kW (3.75 kW per motor)
E.	**TOWER**	
	Type	Welded steel plate according to EN10025
	Corrosion Protection	Double anti corrosion paint inside/Triple anti-corrosion paint outside
F.	**TRANSFORMER**	
	Type	Oil filled transformer
	Rated Power	2500 kVA

Source: http://www.oakland.edu/upload/docs/Energy/Wind%20Project/07%20Suzlon%202.1%20MW%20S97%20-%20Technical-Data.pdf

3.5 Current Status

The wind power project comprises of 50 turbines and the project is in its preliminary construction phase during the site visit. Out of the 50 WTGs, locations for 41 WTGs have been identified and land has been procured. For the remaining nine (9) turbines (PPD 63, PPD 64, PPD 61, PPD 60, PPD 52, PPD 80, PPD 53, PPD 54 and PPD 50), Suzlon is in the process of identifying and finalising the WTG locations. It was observed that out of the 41 project turbines, five (5) WTGs locations were excavated, reinforcement works of two (2) WTGs locations were completed and curing works of two (2) locations were going on. The construction and excavation works for access roads and internal transmission lines have been initiated. Construction works pertaining to 100 MVA transformer at 132/33 kV Suzlon Pooling Substation located at Vajrakarur Village is under progress.

Based on wind resource assessment undertaken for the proposed project by 3 TIER, the mean wind speed at hub height of 90 m has been calculated to be 6.75 m/s.

3.6 Project Schedule

The proposed wind farm is envisaged to be operational by end of February 2016. The Table below provides a detailed description and anticipated schedule of all activities that will occur as part of the construction phase of the wind farm.

Table 3-3: Project Schedule

S.No	Activity	105 MW Wind Farm
1.	Land Procurement	About 149.5 acres of land @ of 2.99 acres per WTG is required for the project turbine locations. Sale deeds for 41 WTGs were executed with individual land sellers as on 30th September, 2015.
2.	Micro- sitting activities	Wind resource assessment for the region was undertaken by 3TEIR in month of June, 2014. The mean wind speed at hub height of 90 m has been calculated to be 6.75 m/s
3.	Internal Pathways/ access roads	Construction of internal pathways was observed to be started at the time of site visit. Access roads of length 55 km and width of 5m is planned for the wind farm. Same is expected to be completed by January, 2016.
4.	Transmission lines	132 kV external transmission line is to be completed by end of February, 2016. 33kV internal transmission lines are expected to be completed by end of January, 2016.
5.	Foundation of WTGs	Foundation works for all 50 WTGs is envisaged to be completed by end of November, 2015.
6.	Erection and Commissioning of WTGs	Initially, first 19 WTGs are planned to be commissioned by end of October, 2015. Rest of 31 WTGs are planned to be commissioned by February, 2016.

Source: Detailed Project Report – Vajrakarur Project

3.7 Power Evacuation System

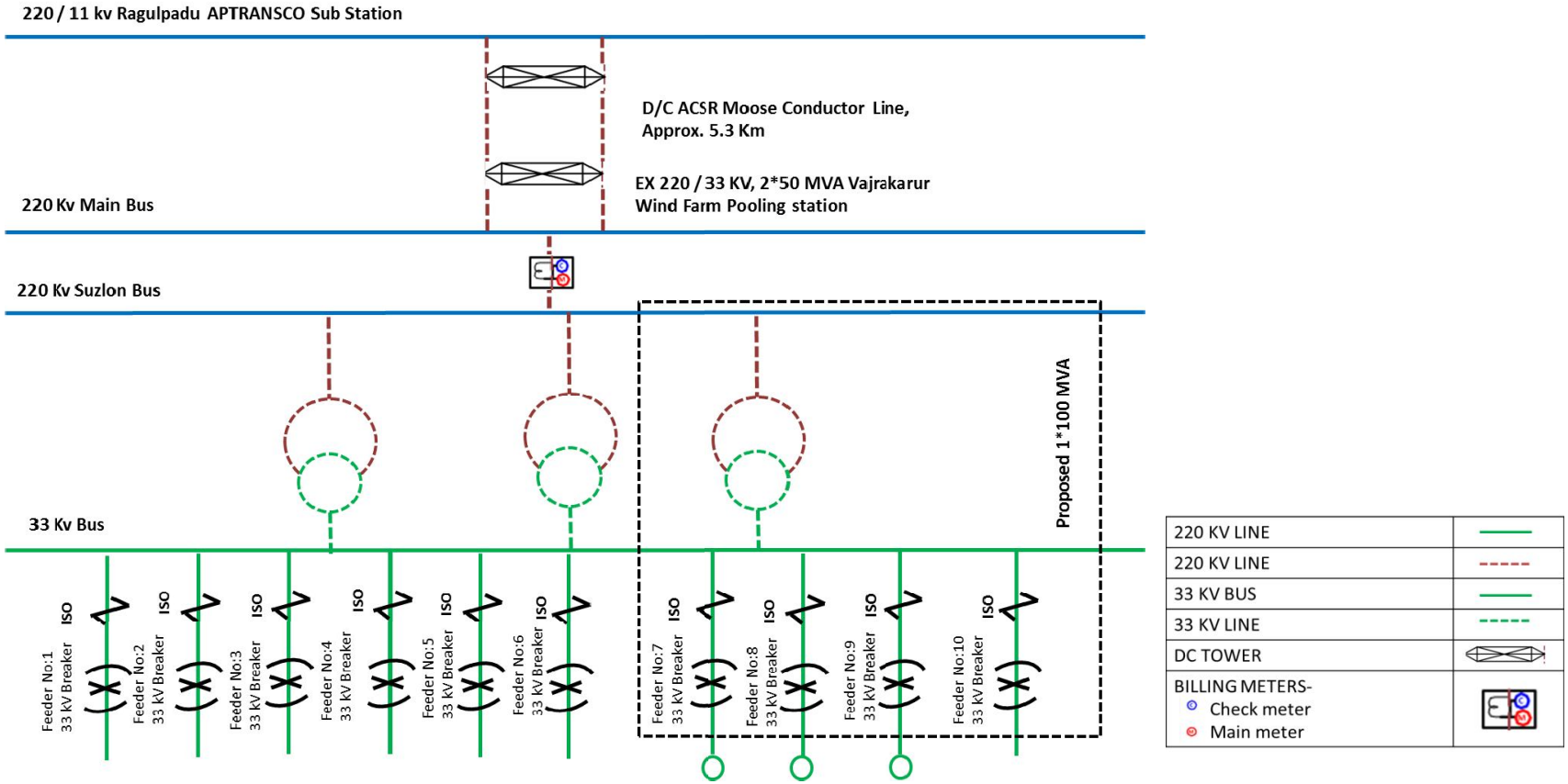
The power generated from 19 WTGs to be commissioned (39.9MW), will be stepped up to 33kV by 0.69/33 kV transformers which are installed along with associated switchgear for each turbine. This will then be transmitted through Single Circuit Overhead (SCOH) 33 kV transmission lines to a Switch Yard, which is proposed to be constructed near WTG No. PPD 81. Further, the power will be evacuated through 14 km long double circuit 33kV transmission line to the 132/33 kV Grid Substation of Transmission Corporation of Andhra Pradesh (AP TRANSCO), at Guntakal

The power generated from the remaining 31 WTGs (65.1 MW) is proposed to be evacuated through a 3 km long double circuit 33 kV transmission line to 132/33 kV Power Substation developed by Suzlon at Gade Hothur village. The pooling substation is constructed in the 21.5 acres of private rain-fed agricultural land. Further, power will be transmitted to 220/11 kV Ragulapadu Grid Substation of AP TRANSCO situated at a distance of 5.3 km from substation developed by Suzlon. A 1×100 MVA transformer has been proposed for augmenting the capacity of pooling substation, out of which 65.1 MW will be utilised for the proposed project site. Approval from construction of transformer has been received from APTRANSCO.

Suzlon is constructing and maintaining the above said power evacuation infrastructure (Pooling substation, Transmission lines & Bays) and will charge a User Fee to MVIPL for using the same. MVIPL shall be signing an agreement with Suzlon for the same, which is part of the Service Contract

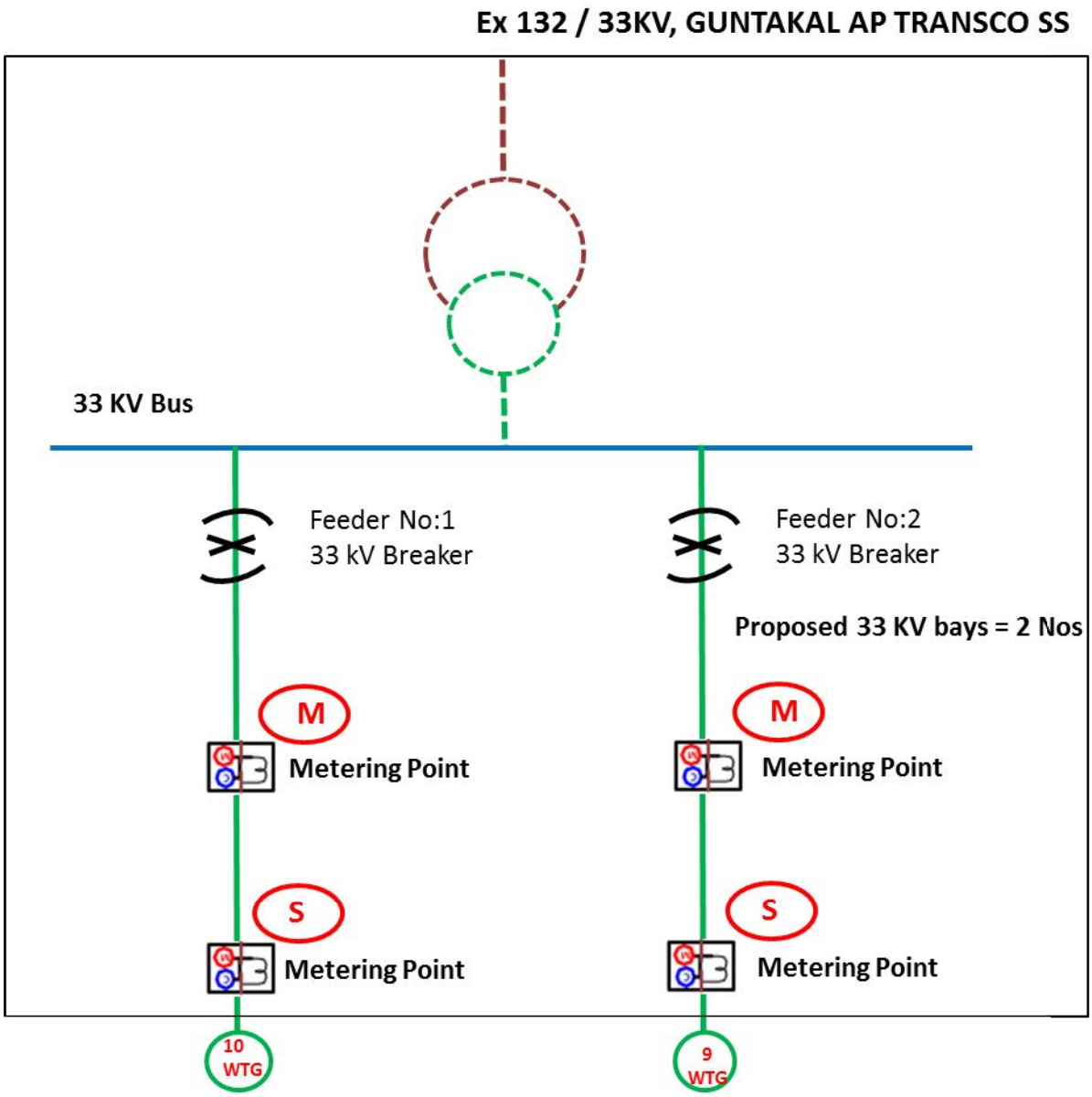
proposed to be placed on Suzlon. The schematic diagrams for proposed power evacuation to both the substations have been shown in figure below.

Figure 3-3: Schematic Diagram for Power Evacuation



Source: MEIL

Figure 3-4: Schematic Diagram for Power Evacuation



Source: MEIL

Photo 3-5: A view of existing pooling substation of Suzlon located at Vajrakarur Village

Photo 3-6: A view of construction works going of proposed 1*100 MVA transformer at Suzlon 132/33 kV Pooling Sub-Station

Source: AECOM Site Survey

3.8 Land Requirement

The proposed 105 MW wind farm project will be developed on 149.5 acres of land falling in seven (7) villages, namely Tatrakallu, Vajrakarur, Gadehothuru, Pottipadu, Gulapalem, Konakondla and Kamalapadu of Vajrakarur Mandal inAnantapur District. The land for the project is privately owned agricultural land,which is purchased through a *willing seller –willing buyer* arrangement with the land owners in the villages. There has been no physical displacement occurring due to the land procurement. During the site survey and consultation with the project developer (M/s. Suzlon) it was reported that M/s Chella Land Developers from Uravakonda, Anantapur is responsible for land procurement and obtaining necessary statutory approvals for the project. The land requirement for the proposed project has been estimated as 149.5 acres based on an area requirement of approximately 2.99 acre per WTG. The project involves procurement of private agricultural land. The pooling substation is constructed in 21.5 acres of private rain-fed agricultural land falling in Gade Hothur Village, whichwas purchased in the year 2011 by Suzlon. The component wise break-up of the land required for the project components is provided in the Table below:

Table 3-4: Component wise break-up of land required for the project

Project Component	Land Area (Acres)/Length (km)	Type of Land	Land Use
Wind Turbines (50 Nos.)	149.5	Private	Majorly Fallow Land, few location Agricultural Land
Pooling Substation	21.5	Private	Agricultural Land
Internal Access Road	~55 km	Private	Fallow and Agricultural Land, Barren at few places
Internal Transmission Line	~33 km	Private	Fallow and Agricultural Land, Barren at few places
External Transmission Line	~14 km	--	--

Source: Suzlon and MEIL

Process for land Procurement

Process of land purchase normally involves a land sale deed between the seller and the buyer on a judicial stamp paper. In this project, the land requirement is large and land titleholders are numerous. Hence, Suzlon preferred to engage individual from the local area (generally restricted to local Panchayat where land is to be bought) to carry out the process of land procurement from the land owners of the Villages. These individuals are called as 'land aggregators'. As described earlier, M/s. Chella is the land aggregator for the project.

To arrive at a rate for negotiation, Suzlon has first undertaken a survey of land rates (registered rate and prevailing market rate) in the area and then fixed a range for negotiation depending upon the attributes of land like access to nearest road head and market value of land by land category. This range is then communicated to M/s. Chella, who then negotiated with the land owners on behalf of Suzlon. The following conditions were considered for whole land procurement process:

- The transaction took place with all the seller's informed consent; and
- Payments made to the seller were above the prevailing market values.

On an average, INR 6 lakhs per acre has been paid to each land seller on *"willing buyer/willing seller"* arrangement. The land rates paid is three (3) times higher than the prevailing market rates (INR 80,000-2, 00,000 per acre). The land sellers have voluntarily sold their land for the proposed project. As on the day of site visit, the registration process was ongoing and is expected to be completed by the month of November 2015.

Land for Access Route

Access to the WTG locations is usually finalised prior to mobilization of manpower and machinery. The construction of access road primarily involves removal of vegetation and modification of topography. Internal access road of approximately 55 km length and 6 m wide has been planned connecting turbine locations to nearest State Highway. The planned access road will be approximately 6 m in width. The access road will be developed on private land which will be purchased through execution of sale deed and by making a one-time payment for the ROW of the road.

Land for transmission line

A relatively small area of 6mx6m will be required for construction of transmission lines poles for including the ROW. In case of land under transmission line route, a No Objection Certificate (NOC) in the form of a Notary Affidavit will be taken from the land owners for the number of poles in the land which is usually followed by one time compensation of approximately INR 25,000-30,000 paid to the owners directly. The same is applicable in case of any access route which might affect the existing crops in the fields.

3.9 Project Implementation

The construction of the proposed wind farm including works related to land acquisition, obtaining statutory approvals, development of logistics route, construction of internal pathways, crane beds, 33 kV transmission lines and pooling substation is being carried out by the Contractor, M/s Suzlon

Energy Limited. Site preparation activities viz., micro siting, arranging temporary water and power supply etc. will also be undertaken by Suzlon.

MVIPL will also enter into an Operations and Maintenance (O&M) Agreement with WTG supplier, M/s Suzlon for operation and maintenance of the project for 20 years. MVIPL in tandem with O&M contractor will be in charge of project management which includes financial and administrative control, overall project co-ordination, manpower selection for operation and maintenance etc.

Approvals from State Nodal Agencies for project implementation and from State Transmission Utilities for power evacuation have been obtained by Suzlon and will be transferred to MVIPL. The broad project implementation mechanism for proposed project has been illustrated in Figure below.

Table 3-5: Project Implementation Arrangements

Particulars	Principally From	Principally To / Secondary From	Secondary To
Nacelle	MVIPL	MEIL / MEIL	SEL
Blade	MVIPL	MEIL / MEIL	SEL
Tubular Tower	MVIPL	MEIL / MEIL	SEL
Transformer	MVIPL	MEIL / MEIL	SEL
Civil Work	MVIPL	MEIL / MEIL	SGWL
Electrical Work	MVIPL	MEIL / MEIL	SGWL
Commissioning	MVIPL	SGWL	
PE	MVIPL	SPIL	
Land	MVIPL	SEL Associates	

**MVIPL: Mytrah Vayu Indravati Private Limited*
MEIL: Mytrah Energy (India) Limited
SEL: Suzlon Energy Limited
SGWL: Suzlon Gujarat Wind Park Limited
SPIL: Suzlon Power Infrastructure Limited

3.10 Project Development – Construction Phase

3.10.1 Access roads

The WTG locations of the proposed project will be accessible by compacted internal approach roads. The proposed internal access roads are about 55 km in length and 5-6 m wide. The internal approach roads will be connected through the nearest state highways SH-26 and SH-32. All these roads will be kept open for access and use by general public.

3.10.2 Site Development

The development of site will require site clearance and levelling works. Each turbine location will require clearing and grading of a diameter of 50 to 80 m around the tower site. There will be removal of ground vegetation during the construction works.

3.10.3 Civil Works

The major civil works for the Project will include laying of wind turbine foundations, erection of turbines, switch yard structure and equipment foundations including power transformer. Minor works will involve construction of security kiosks, roads and drainage facilities. The wind turbine towers proposed for the wind farm will have a hub height of 90 m and will require substantial foundations which would extend to a depth of about 2.5 to 3 m. The depth of foundation will depend on soil and surface conditions. The foundation structure will be floating type which is essentially a gravity foundation that relies upon soil overburden and concrete to provide sufficient weight to resist overturning of the foundation at extreme wind loads.

The erection of tower would require cranes and preparation of platforms for installing cranes. The crane will be used for lifting activities while erecting the turbines; the nacelle will be installed atop the tower first, followed by installation generator, rotor and blades. Construction of related structures will involve civil and steel work for installation of pooling stations, transformers, substation, and electric cables and signal wires.

3.10.4 Labour

During construction phase, the labour requirement will range from 50 - 60 during normal operations and 70 - 100 workers for peak construction activities. The labour required for the construction will be hired locally and no significant influx of migrant population is expected due to the proposed project. The unskilled labour required for construction activities will be locally hired and therefore labour camps will not be set up.

3.10.5 Water and Waste water

The water demand during the construction works will be about 3 m^3 /day and 4.5 m^3/day during normal and peak operations respectively and will be sourced through authorised/approved tankers. During construction, waste water generation will be limited to washing and cleaning activities. Portable toilets will be provided at site to facilitate the disposal of sewage generated.

3.10.6 Waste Generation

The construction activities will lead to generation of wastes such as construction debris, waste from packaging and crafting material for wind turbine components. The movement of heavy machinery for site clearance, earth moving, transportation and erection of wind turbine components will generate waste oil, hydraulic oil, lubricants, paints, degreasers and gearbox oil. Waste oil is classified as a hazardous waste and its storage, transportation and disposal has to be in accordance with the Hazardous Waste Management Handling and Trans-boundary Movement Rules 2008 and amendments. The hazardous waste generated will be disposed-off through an approved recycler.

3.11 Operation and Maintenance

An O&M agreement will be executed with Suzlon which entrusts them with responsibility of maintenance and repairs for the proposed project for 20 years. Suzlon has a project office located at

Uravakonda Village, at a distance of 11 km from the site in south-west direction. The project office also holds the responsibility of carrying out operation and maintenance activities for operational WTGs.

The typical maintenance and repair activity during operation phase involves preventive and breakdown maintenance of Wind turbines and/or the related equipment in accordance with the safety management plans and procedures as applicable and/or in accordance with accepted industry practices.

There will be an O&M facility involving the supervisory control and data acquisition (SCADA) system. This system provides two-way communication with each wind turbine. A SCADA system allows a central computer system to monitor and control each turbine's operation.

3.11.1 Staffs

The proposed wind farm will have 20-25 personnel at site including maintenance, monitoring and security staff during the operation phase. It is proposed to engage people from local community as security staff.

3.11.2 Water and Waste Water

The daily water requirement for the project will be limited to domestic consumption and will be met through packaged drinking water. Waste water generation during the operation phase of the project will be limited to the domestic waste water from the toilets. Septic tanks with adequate capacity arrangement shall be maintained at the project site for managing the waste water generated.

3.11.3 Routine maintenance Works

Preventive Maintenance

Preventive Maintenance involves use of materials and consumables such as lubricants and oils, electrical and mechanical parts etc, and upkeep of the equipment including transformer yard, greasing of main bearings, Yaw Bearing and Blade Bearings; topping up of hydraulic and transformer oil; painting of equipment; brake pads for main brakes and yaw brakes; oil and dry filters; batteries; carbon brushes; coolant; cleaning detergents and solvents; pitch Capacitors; all electrical panels.

Breakdown Maintenance

Major breakdown maintenance anticipated for wind farms include repairs/replacement of Generator and Motors, Nacelle, Rotor Unit, Hub, Transformers, yard, equipment, Blades, Frequency Converter Panels and Control Panels, Tower Components and Electricals; and servicing of Anemometer, Wind vanes, wind sensors and other sensors, Limit switches, etc.

3.11.4 Routine operational Services

Routine activities during operation phase include cleaning and upkeep of the equipment such as:

- Tower Torqueing;
- Blade Cleaning;
- Nacelle and Tower head torqueing and cleaning;
- Frequency Converter Panel and Low Tension Panel Maintenance;
- Site Maintenance; and
- Security.

The operation and maintenance of the wind turbines will be undertaken as per the operation and maintenance manual of S97-2.1 MW WEC wind turbines developed by Suzlon. The operation manual describes the detailed procedures related to operation of each turbine component and the safety requirements that need to be followed during operation. Similarly the maintenance manual gives the procedures to be adopted while undertaking maintenance and repair works, including lubrication of yaw drives and gearbox, checking calibration of blades, checking generator alignment, checking functionality of emergency stop buttons, etc.

3.11.5 Monitoring and Reporting

For the operation phase of the project, the following records will be maintained by Suzlon at the site office;

- Data logging records for power generation, Wind Speeds, grid availability, machine availability, Machine breakdown, etc.;
- Daily and Monthly performance reports;
- Monthly meter reading for State Electricity Board ;
- Visual observation record of wind farm and its components;
- Record of visitors;
- Record of accidents/incidents;
- Record of work permits;
- Records pertaining to Lock-out Tag-out of turbines under maintenance.

4. LEGAL, POLICY AND ADMINISTRATIVE FRAMEWORK

4.1 Introduction

This section highlights the environmental and social regulations applicable to the proposed Wind Power project. The section broadly focuses on the institutional framework, applicable environment, health and safety and social legislative requirements and IFC Performance Standards relevant to the proposed Project.

4.2 Enforcement Agencies

All the permissions and approvals have to be taken from the concerned ministries, line departments and the local civic bodies for any upcoming project in India. The environmental and social governance approach in the country consists of –

- Regulatory and implementing entities;
- Legal framework including policies, acts and laws; and
- Permitting system

In India, Ministry of New and Renewable Energy (MNRE) is the nodal agency to manage wind power projects and the environmental aspects are governed by Ministry of Environment, Forests and Climate Change (MoEFCC), Central Pollution Control Board (CPCB,) Central Electricity Authority (CEA) Central Electricity Regulatory Commission (CERC) and National Institute of Wind Energy (NIWE). The social governance aspects at the micro level are addressed by institutions like panchayats and municipal bodies.

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

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.

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.

Andhra Pradesh Pollution Control Board (APPCB)

Andhra Pradesh Pollution Control Board (APPCB) is a statutory authority entrusted to implement environmental laws and rules within the jurisdiction of the State of Andhra Pradesh, India. The Board ensures proper implementation of the statutes, judicial and legislative pronouncements related to environmental protection within the State. The APPCB was constituted in the year 1976 after the enactment of the first major environmental legislation of the country, the Water (Prevention and Control of Water Pollution) Act, 1974.

The Board functions through its Head Office at Hyderabad, five Zonal Offices headed by five Joint Chief Environmental Engineers and nineteen Regional Offices headed by nineteen Environmental Engineers. The important functions of board comprises of planning and execution of annual action plans to implement the provisions of various rules and Acts; consent management; environmental awareness; ensure legal actions defaulters; waste management and deals with public grievances.

APPCB will be the authorising agency to grant Consent to Operate (CTO) for operations of the proposed 105 MW Wind Power Project.

Department of Environment, Andhra Pradesh

The Environment, Forests, Science and Technology Department is headed by the Principal Secretary, and is divided into nine sections. The Department primarily deals with:

- Proposals relating to forest lands, mining leases, encroachments on forest lands, forest Conservation Act 1980;
- Use of forest land for non-forest purposes, soil conservation Issues relating to Podu cultivation, forest settlement, forest survey and mapping Protection of forests and related notifications;
- Issues relating to destruction of forests;
- Budget planning and Non-Plan schemes;
- Research and development/monitoring and evaluation;
- Social forestry programmes; and
- Development of waste land.

Environment Protection Training and Research Institute (EPTRI) were set up as an independent registered society in 1992 by the department. The main objective of EPTRI is to provide training, consultancy, applied research services and advocacy in the area of environment protection to industry, regulatory bodies, Government, NGOs etc. It also focuses on waste minimization by way of resource / water conservation, segregation etc., through in-plant studies.

Petroleum and Explosives Safety Organization (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 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.

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.

Ministry of New & Renewable Energy (MNRE)

The MNRE is the nodal ministry of Government of India for all matters related to new and renewable energy. The broad aim is to develop and deploy new and renewable energy for supplementing the energy requirements of the country as stated on its website. The role of MNRE has been assuming importance in recent times with growing concerns of energy security. Energy self-sufficiency was

identified as the major driver for new and renewable energy in the wake of the two oil shocks of 1970.

New & Renewable Energy Development Corporation of Andhra Pradesh (NREDCAP)

The genesis of Non-conventional Energy Development Corporation of Andhra Pradesh Limited [NEDCAP] took place in the year 1986 with the help of Government of Andhra Pradesh. The sole objectives of NEDCAP are to:

- Generate electricity through renewable sources like wind and solar on decentralized manner
- Conserve energy in rural areas;
- Import and adopt viable technology and machinery in the areas of Non-conventional energy sources and ensures post installation service; and
- Impart training and to promote research and development in the field of Non-conventional energy sources

MVIPL should obtain an approval for project implementation and Certificate of Commissioning from NREDCAP after commissioning of the project. Project should also be registered under the State Nodal Agency.

Centre for Wind Energy Technology (C-WET)

Centre for Wind Energy Technology (C-WET) has been established in Chennai in the year 1998, as an autonomous R&D institution by the Ministry of New and Renewable Energy (MNRE), Government of India. It functions with the following structure.

- **Research & Development unit:** Its main focus towards novelty in developments of components as well as in sub-systems of wind turbines.
- **Wind Resource Assessment Unit:** The unit identifies resource rich regions in the country by conducting wind resource micro survey and offers its services to the wind farm developers.
- **Standards and Certification Unit:** The unit carries out Provisional Type Certification of Wind Turbines as per the Indian Certification Scheme for Wind Turbines viz. Type Approval - Provisional Scheme - TAPS – 2000 (amended). Standards on Wind Energy are being developed by the unit.

Information, Training & Commercial Service Unit: To establish and update the data bank and serve as finest information centre in wind energy by collecting, collating and analysing the related information.

Suzlon S 97 WTG proposed to be utilized in the project is NIWE certified as per NIWE notification dated 29/10/2013 on "Revised List of Models and Manufacturers of Wind Turbines – Main List".

Central Electricity Authority (CEA)

Central Electricity Authority (CEA) is a Statutory Body constituted under the erstwhile Electricity (Supply) Act, 1948, hereinafter replaced by the Electricity Act 2003, where similar provisions exists, the office of the CEA is an "Attached Office" of the Ministry of Power. The CEA is responsible for the technical coordination and supervision of programmes and is also entrusted with a number of statutory functions.

Central Electricity Regulatory Commission

The Commission intends to promote competition, efficiency and economy in bulk power markets, improve the quality of supply, promote investments and advise government on the removal of institutional barriers to bridge the demand supply gap and thus foster the interests of consumers. In pursuit of these objectives the Commission aims to –

- Improve the operations and management of the regional transmission systems through Indian Electricity Grid Code (IEGC), Availability Based Tariff (ABT), etc.;
- Formulate an efficient tariff setting mechanism, which ensures speedy and time bound disposal of tariff petitions, promotes competition, economy and efficiency in the pricing of bulk power and transmission services and ensures least cost investments; facilitate open access in inter-state transmission;
- Facilitate inter-state trading;
- Promote development of power market; and
- Improve access to information for all stakeholders;

Gram Panchayat

Gram Sabha or the Panchayats are the local bodies which have been bodies defined by the 73rd Constitutional Amendment Act, 1992. Panchayats have to be consulted before making the acquisition of land in the Scheduled Areas for development projects and before re-settling or rehabilitating persons affected by such projects in the Scheduled Areas. The responsibilities that have been entrusted upon Panchayats comprises of the preparation of plans for economic development and social justice and the implementation of such schemes for economic development and social justice, as may be assigned to them.

A Non- Objection Certificate (NOC) has to be obtained for the project from the Gram Panchayat of all the project villages for installation of 50 WTGs.

Transmission Corporation of Andhra Pradesh Limited (AP TRANSCO)

APTRANSCO came into existence on 1st February, 1999. APTRANSCO remained as Single buyer From Feb 1999 to June 2005 in the state-Purchasing power from various Generators and selling it to DISCOMs in accordance with the terms and conditions of the individual PPAs at Bulk Supply Tariff (BST) rates. Subsequently, in accordance with the Third Transfer Scheme notified by Government of Andhra Pradesh, APTRANSCO ceased to do power trading and has retained powers of controlling system operations of Power Transmission.

Approval for route of transmission line from site to 132/ 33kv Sub –Station located at Guntakal and Ragulpadu for Power Evacuation has to be obtained from AP TRANSCO. Approval has also to be obtained from Electrical Inspectorate, Andhra Pradesh for interconnection scheme and bay equipment along with protection equipment.

4.3 Applicable Environmental and Social Laws, Regulations and Policies

The relevant Acts and Rules pertaining to the project have been summarised in the following Table 4-1. Some of the policies (including sector specific) have been discussed briefly in the subsequent sections.

National Environmental Policy 2006

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.

MVIPL shall ensure compliance to the requirements of this policy.

National Electricity Policy 2005

The National Electricity Policy 2005 states that Environmental concerns would be suitably addressed through appropriate advance action by way of comprehensive Environmental Impact Assessment and implementation of Environment Action Plan (EAP). As per the policy, adequate safeguards for environmental protection with suitable mechanism for monitoring of implementation of Environmental Action Plan and R&R Schemes should be put in place. Open access in transmission has been introduced to promote competition amongst the generating companies who can now sell to different distribution licensees across the country. This should lead to availability of cheaper power.

Andhra Pradesh Wind Energy Policy, 2015

The Wind Energy Policy has been formulated 13th February, 2015 by Energy, Infrastructure & Investment Department, and Andhra Pradesh with the following objectives:

- To encourage, develop and promote wind power generation in the State with a view to meet the growing demand for power in an environmentally and economically sustainable manner;
- To attract private investment to the State for the establishment of large wind power projects; and
- To promote investments for setting up manufacturing facilities in the State to generate local employment.

MVIPL intends to install 50 Wind Turbine Generators (WTGs) of Suzlon make, S-97model (rotor diameter of 97 m and hub height of 90m with tubular tower) of 2.1 MW rated capacity, which is in line with clause no '7- Repowering' of the above said policy. Also, Suzlon holds the responsibility for development of power evacuation facilities along with interconnection scheme and bay equipment along with protection equipment from the proposed project till the grid sub-station of AP TRANSCO.

Table 4-1: Applicable Environmental and Social Laws, Regulations and Policies

S. No.	Issues	Relevance	Applicable Legislation	Agency Responsible	Applicable Permits and Requirements
1.	Environmental Protection	Construction activities will generate air and noise emissions. Scattering of debris and construction material can contaminate the soil and surroundings	The Environment (Protection) Act 1986, as amended in April 2003; EPA Rules 1986, as amended in 2002.	APPCB MoEFCC CPCB	Compliance under the rules to maintain stipulated standards and environmental management through various supporting rules promulgated under the Act.
2.	Prevention and Control of Water Pollution	Waste water generation from construction and operation of the project	The Water (Prevention and Control of Pollution) Act, 1974, amended in 1988	APPCB	Consent to Operate As per the revised classification of industries into Red, Orange and Green Category, issued by Central Pollution Control Board dated June 4, 2012[2], the solar power generation through solar photovoltaic cell, Wind Power & mini hydel power (<25 MW) are classified under Green Category Industries and require Consent to Establish and Consent to Operate under Water (Prevention and Control of Pollution) Act, 1974. However, as per order issued by Government of Andhra Pradesh dated 13th February, 2015 under Andhra Pradesh wind power policy 2015- "Wind power projects" have been exempted from obtaining NOC/ Consent for Establishment under pollution control laws from Andhra Pradesh Pollution Control Board. However, it is recommended that the MVIPL should

[2] As per the 57 th Conference of Chairmen and Member Secretaries

S. No.	Issues	Relevance	Applicable Legislation	Agency Responsible	Applicable Permits and Requirements
					obtain Consent to Operate under Water Pollution Act, 1974 from APPCB.
3.	License under Factories Act, 1948	Factory license is required as 'factory' means '*any premises having ten or more workers involved in a manufacturing process*'.	Chapter I of The Factories Act, 1948	Factories Inspectorate, Andhra Pradesh	Factory License from the State Government or Chief Inspectorate of Factories, Andhra Pradesh
4.	Water Cess Collection (a tax on water use and water pollution caused)	Water use and waste water generation	The Water (Prevention and Control of Pollution) Cess Rules 1978, as amended through 16th July 1992and Water (Prevention and Control of Pollution) Cess Act 1977, as amended through 6th May 2003	APPCB	Filing of monthly returns as per prescribed format (Form I under the Act) Compliance under the Act
5.	Noise Emissions	Noise generated from operation of construction machinery	The Noise (Regulation & Control) Rules, 2000 as amended in October 2002. As per the Environment (Protection) Act (EPA) 1986 the ambient noise levels are to be maintained as stipulated by CPCB for different categories of areas like, commercial, residential and silence zones etc.	APPCB	There will be generation of noise during construction activities and during operation of WTGs. 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 and operation activities. The project is required to maintain the noise limits prescribed for residential (55 dB (A) for daytime and 45 dB (A) for night-time. *MVIPL/ Suzlon shall ensure compliance under the*

S. No.	Issues	Relevance	Applicable Legislation	Agency Responsible	Applicable Permits and Requirements
					rules to maintain stipulated standards.
6.	Hazardous Wastes Management	The proposed project will generate waste oil from diesel generator and transformer oil from switchyard. Solvents and chemicals used or cleaning etc.	Hazardous Wastes (Management Handling and Trans boundary Movement) Rules, 2008 as amended up to 2009 under Environment (Protection) Act, 1986	APPCB	Authorization for collection, reception, storage, transportation and disposal of hazardous wastes Filing of annual return under the rules Other compliance under the rules authorization 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.
7.	Electricity Distribution License	Private sector projects to obtain distribution Licenses from the State Electricity Regulation Committee and to have open access to the transmission lines	The Electricity Act 2003 including rules 1956 and 2005	State Electricity Regulation Committee	MVIPL/Suzlon shall obtain license under the electricity act and ensure that the Health and Safety requirements specified under the rules are compiled to.

S. No.	Issues	Relevance	Applicable Legislation	Agency Responsible	Applicable Permits and Requirements
8.	Storage of Petroleum products	There will be storage of Diesel at site for operation of generators during construction phase.	The Petroleum Act 1934, as amended in August 1976 The Petroleum Rules 1976, as amended in March 2002.	PESO (Chief Controller of Explosives)	The site will store a small quantity of fuel at site. However, in case fuel storage exceeds the limit as stipulated in the Act, MVIPL/ Suzlon is required to obtain a license from PESO.
9.	Surface Transportation	Movement of construction vehicles and other vehicles for transportation of workers	The Motor Vehicles Act 1988, as amended by Motor Vehicles (Amendment) Act 2000, dated 14th August 2000 The Central Motor Vehicles Rules 1989, as amended through 20th October 2004 by the Central Motor Vehicles (Fourth Amendment) Rules 2004.	State Transport Authority	Compliance of stipulated standards under rule 115 Safety compliance under the rules
10.	Welfare and Work Environment	Engagement of workers for construction and operation of the plant	The Factories Act, 1948 and Andhra Pradesh Factories Rules, 1950	Deputy Chief Inspector of Factories.	MVIPL/Suzlon shall comply with all requirements of factories rules and participate in periodic inspection. MVIPL/Suzlon will ensure that no child labour is engaged.
11.	Labour	Engagement of Child Labour at site	The Child Labour (Prohibition and Regulation) Act, 1986	Department of Inspectorate of Factories, Andhra Pradesh	The Act prohibits employment of children in certain occupation and processes. The Act also specifies conditions of work for children, if permitted to work. MVIPL/Suzlon will ensure compliance
12.	Labour	Engagement of bonded Labour at site	Bonded Labour (Abolition) Act 1976	Department of Inspectorate of Factories, Andhra	All forms of bonded labour is abolished MVIPL/Suzlon will ensure compliance

S. No.	Issues	Relevance	Applicable Legislation	Agency Responsible	Applicable Permits and Requirements
				Pradesh	
13.	Labour	Provision of wages to labour engaged at the site	Minimum Wages Act, 1948	Department of Inspectorate of Factories, Andhra Pradesh	Requires the Government to fix minimum rates of wages and reviews this at an interval of not more than 5 years. Every employer shall be responsible for the payment to persons employed by him of all wages required to be paid under this Act. MVIPL/Suzlon will ensure compliance
14.	Labour	Equal wages to male and female workers at site	Equal Remuneration Act 1976	Department of Inspectorate of Factories, Andhra Pradesh	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. MVIPL/Suzlon will ensure compliance
15.	Labour	Engagement of Labour at site	Workmen's Compensation Act, 1923	Department of Inspectorate of Factories, Andhra Pradesh	Requires 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. MVIPL/Suzlon will ensure compliance
16.	Labour	Engagement of Female Labour at site	Maternity Benefit Act, 1961	Department of Inspectorate of Factories, Andhra Pradesh	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

S. No.	Issues	Relevance	Applicable Legislation	Agency Responsible	Applicable Permits and Requirements
					the foetus, or is likely to cause her miscarriage or otherwise to adversely affect her health. MVIPL/ Suzlon will ensure compliance
17.	Public Consultation and Local Grievances	The project is set in rural area surrounded by villages	Andhra Pradesh Panchayats Act 1994	Panchayat Union	Provides for application of consent from the respective panchayat body/village administrative officer etc., during the project life cycle. MVIPL/ Suzlon will ensure that all grievances raised by locals related to the project are addressed.
18.	Acquisition of Private land for the project.	Private land has been procured from a total of seven (7) villages, Vajrakarur Mandal, Anantapur District	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013	Chief Commissioner of Land Administration	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act is applicable only when land acquisition involving rehabilitation and resettlement and compensation is carried out by appropriate Government for its own use, hold and control including for Public Sector Undertakings for public purpose and for public private partnership projects. *The land procured for the project is private agricultural land. The land has been procured on a 'willing buyer/willing seller' basis wherein the individually negotiated directly with the land seller with the help of a land aggregator and land prices have been determined above the prevailing market value.* *Since no Government authorities are involved in the land procurement process and the project does not come under the purview of public private partnership, the Right to Fair Compensation and*

S. No.	Issues	Relevance	Applicable Legislation	Agency Responsible	Applicable Permits and Requirements
					Transparency in Land Acquisition, Rehabilitation and Resettlement Act is not applicable.
19.	Possession of valid license by the engaged contractor.	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.	Building and Other Construction Workers (Regulation Of Employment And Conditions Of Service) Act, 1996 and Contract Labour (Regulation and Abolition) Act, 1970.	Registration Officer	MVIPL/ Suzlon should ensure that contractor/ third party have a valid registration under the Building and Other Construction Works Act and Contract Labour (Regulation and Abolition) Act, 1970.
20.	Labour working at the site	Working conditions of contracted Labour working at the site	Andhra Pradesh Contract Labour (Regulations and Abolition) Rules, 1971	The Commissioner of Labour, Andhra Pradesh	MVIPL/ Suzlon should ensure that all the contracted workers are provided with condition of services, rate of wages, holidays, hours of work as stipulated in the rules.
21.	Conditions of Motor Vehicles associated with the proposed project	Every motor vehicle other than motor cycles of engine capacity not exceeding 70 cc, manufactured prior to the first day of March 1990, shall be maintained in such condition and shall be so driven so as to comply with the standards prescribed in these rules.	The Motor Vehicles Act 1988, as amended by Motor Vehicles (Amendment) Act 2000, dated 14th August 2000 The Central Motor Vehicles Rules 1989, as amended through 29th June, 2012	Andhra Pradesh Transport Department	MVIPL/ Suzlon shall ensure Compliance of stipulated emission standards under Rule 115.

4.4 IFC Performance Standards

The IFC Performance Standards stipulates that any proposed project shall meet the following requirements 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.

Performance Standard 1

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; and
- The project proponent's management of environmental and social performance throughout the life of the project.

Applicability

The PS 1 is applicable to projects with environment and/or social risks and/or impacts. The proposed project will have environmental and social impacts such as generation of noise and small quantities of hazardous wastes (operation of DG sets etc.). PS 1 is therefore applicable for the project and thus requires an Environmental and Social Impact Assessment (ESIA) study to be conducted before commencement of the project. MVIPL also needs to develop and implement a project specific Environmental and Social Management System to manage the risks associated with project's operations.

Performance Standard 2

PS 2 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:

- 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 in the client's supply chain;
- To promote safe and healthy working conditions, and the health of workers; and
- To avoid the use of forced labour.

Applicability

The applicability of PS 2 will be more important during the construction phase as operation phase will only have limited number of staff. It not only covers the main plant employees, but all employees/workers, even those working through contractors. Migrant workers be engaged for the project will stay in rented accommodation in nearby villages; therefore standards pertaining to campsites will not be applicable. MVIPL/ Suzlon shall provide adequate provisions such as access to clean water, sanitary facilities and other necessary facilities at the construction sites.

MVIPL shall take measures to prevent child labour, forced labour and discrimination at site. Freedom of association and collective bargaining shall be provided. Wages, work hours and other benefits shall be as per the national labour and employment laws. MVIPL/ Suzlon will provide a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns. In providing a grievance mechanism through which workers may raise workplace concerns, MVIPL should ensure that matters are brought to management's attention and addressed expeditiously. MVIPL/Suzlon needs to document all grievances and follow up on any corrective actions.

Suzlon/ MVIPL will extend a safe and healthy work environment to contracted workers and to any other workers who provide project-related work and services. MVIPL should ensure that training is provided to all workers on relevant aspects of OHS associated with their daily work, including emergency arrangements and OHS briefing for visitors and other third parties accessing the premises. All occupational injuries, illnesses and fatalities are to be documented.

MVIPL should develop and implement procedures to manage and monitor performance of third parties. These procedures should be integrated in the day-to-day operations of the company and requirements should be clearly communicated to third parties, and if possible to workers engaged by these third parties.

Performance Standard 3

The PS 3 outlines approach to pollution prevention and abatement in line with internationally disseminated technologies and practices with the following objectives:

- Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from activities; and
- Promote the reduction of emissions that contribute to climate change.

Applicability

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 entail 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 and used oil. MVIPL should monitor emissions to ensure that the requirements of PS 3 are being met. The frequency with which pollutant emissions are monitored should be appropriate to the nature, scale and variability of potential impacts.

Performance Standard 4

PS 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. Its 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.

Applicability

The applicability of this PS shall be established during the ESIA process, resulting in preparation of an Action Plan to be disclosed to the community. The Applicability will be limited to construction period with movement of heavy machinery / vehicles. Noise levels and shadow flicker impacts at adjoining villages to be kept within the acceptable norms and IFC guidelines. Labour and security staff to be engaged from local community.

The Action Plan and any other relevant project-related information is to enable the influenced communities and relevant government agencies to understand these risks and impacts, and will engage the influenced communities and agencies on an on -going basis consistent with the requirements of PS 1.

Performance Standard 5

PS 5 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 affected persons and community.

Applicability

For the proposed project, a total of 149.5 acres of private agricultural land has been procured. Prior to the procurement of land, the site was used for cultivation of groundnut, Bengal gram, castor etc.

During site visit and interactions with land owners, it was evident that no physical displacement has been taken place. The procurement has resulted only in limited economic displacement.

Compensation for land and other assets have been calculated at the market value plus the transaction costs related to restoring the assets. During the consultations, it was observed that the procurement of land was based on "willing buyer/willing seller," process wherein the households had voluntarily sold their property and assets. Suzlon has also followed the norms: (i) the transaction took place with the seller's informed consent; and (iii) the seller was provided with fair compensation based on prevailing market values.

MVIPL will engage community for disclosure of relevant information and participation of Affected Communities during the planning and implementation stage of the project. A Stakeholder Engagement Plan has been developed as a part of environment and social management plan.

Performance Standard 6

PS 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, 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.

Applicability

The applicability of this PS shall be detailed out in the Environmental and Social Impact Assessment Study, while implementation of the actions necessary to meet the requirements of this PS shall be managed through the suggested mitigation measures. The operation phase of the proposed project shall ensure protection of fauna and flora of the site and surrounding.
Baseline studies for ecological aspects have been described in section 7.3 of the report. The study has been gathered through site survey, literature review and initial desktop analysis. The extent of the literature review depend on the sensitivity of the biodiversity attributes associated with the project's area of influence and the ecosystem services that may be impacted.

Performance Standard 7

PS 7 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.

Applicability

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 people are dependent. Hence, PS7 is not applicable for this project.

Performance Standard 8

PS 8 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.

Applicability

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. A small temple was observed to be located at a distance of 130 m in South-West Direction of WTG location no. PPD 34. However, the access to the temple doesn't get restricted as a result of the project activities. Hence, PS8 is not applicable for this project.

4.5 IFC 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 categorization. This categorization 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 following categories are used by the IFC:

- ***Category A Projects***: Projects with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented;
- ***Category B Projects***: Projects with potential limited adverse social or environmental 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 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 categorizes projects primarily according to the significance and nature of 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.

4.6 EHS Guidelines of IFC

The Equator Principle 3 requires follow up of the environmental, health and safety requirements as per the following guidelines released by IFC on 30th April 2007:

- Environmental, Health, and Safety General Guidelines
- Environmental, Health, and Safety Guidelines for Wind Energy issued on 7th August, 2015.

The key requirements stated in the EHS guidelines have been discussed in the Table below:

Table 4-2: Key Requirements as per EHS Guidelines of IFC

S.No	Relevant Requirements as stated in EHS and Wind Energy Guidelines
1.	*Landscape and visual impacts*
➢	Consideration should be given to turbine layout, size, and scale in relation to the surrounding landscape and seascape character and surrounding visual receptors
➢	Consideration should also be given to the proximity of turbines to settlements, residential areas, and other visual receptors to minimize visual impacts and impacts on residential amenity, where possible.
➢	Maintain a uniform size and design of turbines (e.g., type of turbine and tower, as well as height).
➢	Minimize presence of ancillary structures on the site by minimizing site infrastructure
➢	Erosion measures should be implemented and cleared land should be promptly re-vegetated with local seed stock of native species.
2.	*Noise*
➢	All modelling should take account of the cumulative noise from all wind energy facilities in the vicinity having the potential to increase noise levels.
3.	*Bio-Diversity*
➢	Baseline biodiversity surveys, where required, should occur as early as possible
➢	Consider adjustments of cut-in wind speeds to reduce potential bat collisions.
➢	Eliminate "free-wheeling" (free spinning of rotors under low wind conditions when turbines are not generating power).
➢	Install bird flight diverters on transmission lines and guy wires from meteorological masts to reduce bird collisions
4.	*Shadow Flicker*
➢	Modelling should be carried out in order to identify the distance to which potential shadow flicker effects may extend
➢	Wind turbines can be programmed to shut down at times when shadow flicker limits are exceeded.
➢	Site wind turbines appropriately to avoid shadow flicker being experienced or to meet limits placed on the duration of shadow flicker occurrence.
5.	*Wastewater Discharges*
➢	Water use efficiency to reduce the amount of wastewater generation.
➢	Compliance with national or local standards for sanitary wastewater discharges.
6.	*Occupational Health and Safety*
a.	*Over-exertion*
➢	Training of workers in lifting and materials handling techniques including the placement of weight limits.
➢	Planning work site layout to minimize the need for manual transfer of heavy loads.
➢	Implementing administrative controls into work processes, such as job rotations and rest or stretch breaks.

S.No	Relevant Requirements as stated in EHS and Wind Energy Guidelines
	Slips and Falls
➢	Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths.
➢	Cleaning up excessive waste debris and liquid spills regularly.
b.	*Work in Heights*
➢	Training and use of temporary fall prevention devices
➢	Training and use of personal fall arrest systems
c.	*Stuck by Objects*
➢	Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap.
➢	Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes.
d.	*Moving Machinery*
➢	Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic.
➢	Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.
e.	*Dust*
➢	Implementation of Dust suppression techniques such as applying water
➢	Community Health and Safety
f.	*Disease Prevention*
➢	Providing surveillance and active screening and treatment of workers.
g.	*Traffic Safety*
➢	Adoption of safety measures those are protective of project workers and of road users, including those who are most vulnerable to road traffic accidents.
➢	Regular maintenance of vehicles and use of manufacturer approved parts.
7.	*Community Health & Safety*
➢	Turbines must be sited at an acceptable distance ("setback") between wind turbines and adjacent sensitive receptors to maintain public safety in the event of blade failure.
➢	Minimize the probability of a blade failure by selecting wind turbines that have been subject to independent design verification/certification (e.g., IEC 61400-1), and surveillance of manufacturing quality.
➢	Ensure that lightning protection systems are properly installed and maintained
➢	Equip wind turbines with vibration sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary.
h.	*Public Access*
➢	Provide fencing of an appropriate standard around the substation with anti-climb paint and warning signs.
➢	Prevent access to turbine tower ladders.
➢	Post information boards about public safety hazards and emergency contact information.
8.	*Occupational Health and Safety Monitoring*
➢	Recording all incidents that occur over the course of project implementation.
➢	Recording near-miss (also known as near-hit) data during a project in order to identify trends and implement improvements.
➢	Carrying out workplace and worker auditing to assess the effectiveness of risk management systems and workplace safety culture.
➢	Conducting worker consultation and feedback via questionnaires or periodic safety meetings.

4.7 Applicable ADB Policies and Requirements

4.7.1 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 wind energy which is one of the cleanest sources of energy according to European Wind Energy Association (EWEA). 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 procurement of private land from seven (7) villages in Vajrakarur mandal of Anantapur districts of Andhra Pradesh. No physical displacement is involved in the process. The project area comprises of rain fed agricultural land. Due to limited rainfall and declining levels of groundwater in the region, agricultural land owners are inclined to sell off some parcels of their land. The land procured is on willing buyer willing seller basis and compensation paid is higher than the market value hence the project does not entail economic displacement. 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 native peoples are dependent. Therefore, adverse impact on indigenous people is not anticipated.

Information, Consultation and Disclosure

Consultation and participation are essential in achieving the safeguard policy objectives. This implies that there is a need for prior and informed consultation with affected persons and communities in the context of safeguard planning and for continued consultation during project implementation to identify and help address safeguard issues that may arise. The consultation process begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle. It provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people and is undertaken in an atmosphere free of intimidation or coercion. In addition, it is gender inclusive and responsive and tailored to the needs of disadvantaged and vulnerable groups and enables the incorporation of all relevant views of affected people and other stakeholders into decision making. ADB requires the borrowers/clients to engage with communities, groups or people affected by proposed projects and with civil society through information disclosure, consultation and informed participation in a manner commensurate with the risks to and impacts on affected communities. For projects with significant adverse environmental, involuntary resettlement or Indigenous Peoples impacts, ADB project teams will participate in consultation activities to understand the concerns of affected people and ensure that such concerns are addressed in project design and safeguard plans.

It was informed at the time of site visit that community around the vicinity of the project site has been informally informed about the proposed project. The community are aware of the Site Office premises and the concerned person to contact and are free to get in touch whenever required. However, no formal meetings have been undertaken by MVIPL team to disseminate any project related information.

4.7.2 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 in the project area, measures for ensuring their overall development shall be taken up by the project proponent. MVIPL shall comply with applicable labour laws in relation to the Project. It shall also take the following measures to comply with the core labour standards[3] 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

[3]The 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.

prohibiting any form of discrimination against women during hiring and providing equal work for equal pay for men and women engaged by MVIPL or its contractors);

(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 labor[4] or forced labor[5];

(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.

4.7.3 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.

MVIPL shall ensure that the requirements of ADB's PCP are complied with. It shall engage regularly with the stakeholders identified for the project throughout the project life cycle with essential communications and information-sharing aspects intrinsic to the project to maintain greater transparency and accountability amongst the project's stakeholders. This will enable the stakeholders to better participate in the decisions that may impact/affect them during the project life cycle.

4.8 ADB's Environment 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 that are irreversible, diverse, or unprecedented.

[4]Child 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)

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

- **Category B Projects**: Projects with potential adverse environmental impacts that are less in number, generally site-specific, mostly reversible and readily addressed through mitigation measures;
- **Category C Projects**: Projects with minimal or no adverse environmental impacts;
- **Category FI Projects**: Projects which involve investment of ADB funds to or through a financial investment.

4.9 Applicable Environmental Standards

4.9.1 Ambient Air Quality

As per the IFC EHS guidelines (December 2008), "the ambient air quality standards are ambient air quality levels established and published through national legislative and regulatory processes and ambient quality guidelines refer to ambient quality levels primarily developed through clinical, toxicological, and epidemiological evidence (such as those published by the World Health Organization)". National Ambient Air Quality (NAAQ), as notified under Environment (Protection) Rules 1986 and revised through Environment (Protection) Seventh Amendment Rules, 2009 are given in Table below:

Table 4-3: National Ambient Air Quality Standards

Pollutant	Time Weighted Average	Concentration in Ambient Air	
		Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (notified by Central Government)
Sulphur Dioxide (SO_2), µg/m^3	Annual*	50	20
	24 Hours**	80	80
Nitrogen Dioxide (NO_2), µg/m^3	Annual*	40	30
	24 Hours**	80	80
Particulate Matter (size less than 10 µm) or PM_{10}, µg/m^3	Annual*	60	60
	24 Hours**	100	100
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$, µg/m^3	Annual*	40	40
	24 Hours**	60	60
Ozone (O_3), µg/m^3	8 Hours**	100	100
	1 Hour**	180	180
Lead (Pb), µg/m^3	Annual*	0.5	0.5
	24 Hours**	1	1
Carbon Monoxide (CO) , mg/m^3	8 Hours	2	2
	1 Hour**	4	4
Ammonia (NH_3), µg/m^3	Annual*	100	100
	24 Hours**	400	400
Benzene (C_6H_6), µg/m^3	Annual*	5	5
Benzo (O) Pyrene (BaP), particulate phase only, ng/m^3	Annual*	1	1
Arsenic (As), ng/m^3	Annual*	6	6
Nickel (Ni), ng/m^3	Annual*	20	20

** Annual arithmetic mean of minimum 104 measurements in a year taken twice a week, 24 hourly at uniform interval*

*** 24 hourly or 8 hourly or 01 hourly values as applicable shall be complied with 98% of the time in a year. 2% of the time they may exceed, but not on 2 consecutive days. Note: Whenever and wherever monitoring results on two consecutive days*

of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

4.9.2 Ambient Noise Standards

As per the EHS guidelines of IFC, for residential, institutional and educational area, the one hourly equivalent noise level (L_{eq} hourly) for day time is **55 dB (A)** while the L_{eq} 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 below:

Table 4-4: 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
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 m around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.*

4.9.3 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 4-5: 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
¾	107
½	110
¼	115
Never	>115

Note:
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.

4.9.4 Water Quality Standards

The designated best use classification as prescribed by CPCB for surface water is as given in Table 4-6.

Table 4-6: Primary Water Quality Criteria for Designated-Best-Use-Classes

Designated-Best-Use	Class	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	• Total Coliforms Organism MPN/100ml shall be 50 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/l or more • Biochemical Oxygen Demand 5 days 20^{o}C 2mg/l or less
Outdoor bathing (Organised)	B	• Total Coliforms Organism MPN/100ml shall be 500 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 5mg/l or more • Biochemical Oxygen Demand 5 days 20^{o}C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	• Total Coliforms Organism MPN/100ml shall be 5000 or less • pH between 6 to 9 • Dissolved Oxygen 4mg/l or more • Biochemical Oxygen Demand 5 days 20^{o}C 3mg/l or less
Propagation of Wild life and Fisheries	D	• pH between 6.5 to 8.5 • Dissolved Oxygen 4mg/l or more • Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	• pH between 6.0 to 8.5 • Electrical Conductivity at 25oC micro mhos/cm Max.2250 • Sodium absorption Ratio Max. 26 • Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

Source: Central Pollution Control Board

As per the IFC EHS guidelines, the treated sewage discharge is required to meet the following guidelines.

Table 4-7: Treated Sewage Discharge Guidelines of IFC

S.No.	Parameter	Guideline Value
1	pH	6-9
2	BOD	30mg/l,
3	COD	125mg/l,
4	Total Nitrogen	125 mg/l,
5	Oil and Grease	10 mg/l,
6	Total Suspended Solids	50 mg/l and
7	Total coliform bacteria	400 MPN/100 ml

4.10 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 the Table below:

Table 4-8: Relevant International Conventions applicable to the project

S.No.	International Conventions	Salient Features
1	Montreal Protocol on Substances That Deplete the Ozone Layer (and subsequent Amendments)	India signed the Montreal Protocol along with its London Amendment on 17-9-1992 and also ratified 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 3rd 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: • 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)

5. ANALYSIS OF ALTERNATIVES

5.1 Introduction

As per IFC Performance Standards, a detailed analysis of probable alternatives for the chosen technology and location of project site along with other similar factors that contribute to the project as a whole is carried out prior to selection of each one of them. In order to make the process of arriving at the best alternative as transparent as possible, the following scenarios are taken into consideration:

1) Project vs No Project scenario;
2) Alternate Location for Project Site;
3) Alternate Source for Power Generation;
4) Alternate Technology for the project; and
5) Alternate route for Transmission Lines

5.2 Project vs No Project Scenario

Access to energy is a fundamental enabler for economic development and prosperity of any region. A survey conducted by the World Energy Council states that as the population increases and as the growing rate of electrification places huge requirements on energy supplies, the total primary energy demand of India is expected to increase by almost 150% by 2035.

After the bifurcation of Andhra Pradesh state, there is a rising demand for power in the successor state to build a new economy, attract investments and accelerate growth. The demand – supply scenario in Andhra Pradesh as obtained from the daily reports of the State Load Dispatch Centers (SLDC) is presented in the Table 5-1. The average over a two month period between June 14th and July 14th has been used to calculate the values provided.

Table 5-1: Existing Demand – Supply scenario in Andhra Pradesh

Parameter	Unit	Value
Average Daily Requirement	MU	135.6
Average Daily Supply	MU	125.6
Average Daily Shortage	MU	10
Average Daily percentage shortage	%	7.37
Unrestricted Maximum Demand reached	MW	6859
Maximum shortage	MW	1025

Source: Joint advisory document for Andhra Pradesh and Telangana, Andhra Pradesh Electricity Regulatory Commission

The actual power supply position of Andhra Pradesh in terms of Energy requirement and Peak demand for the year 2014-15 as per the Load Generation Balance Report 2015-16, prepared by Central Electricity Authority is given in Table below:

Table 5-2: Power supply position of Andhra Pradesh

Requirement (MU)	Availability (MU)	Surplus (+) / Deficit (-)	
		(MU)	(%)
Actual Power supply position - Energy requirement vis-à-vis Energy availability (2014-15)			
59198	56313	-2885	-4.9
Actual power Supply position in terms of Peak Demand vis-à-vis Peak Met (2014-15)			
7,144	6784	-360	-5.0

Source: Load Generation Balance Report 2015-16, Central Electricity Authority

Based on the data extracted from Load Generation Balance Report, Table provides:

a) Month-wise power supply position of Andhra Pradesh during the year 2014-15 in terms of peak demand
b) Month-wise power supply position of Andhra Pradesh during the year 2014-15 in terms of energy

Table 5-3: Month-wise power supply position of Andhra Pradesh in terms of peak demand and in terms of energy

	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15
Month-wise power supply position of Andhra Pradesh during the year 2014-15 (in terms of peak demand)												
Peak Demand (MW)	13773	12305	7144	6548	6754	6445	6549	6128	5986	6397	6530	6790
Peak Availability (MW)	12446	11329	6158	6072	6549	6380	6482	6030	5976	6392	6518	6784
Surplus (+)/Deficit (-) (MW)	-1327	-976	-986	-476	-205	-65	-67	-98	-10	-5	-12	-6
(%)	-9.6	-7.9	-13.8	-7.3	-3.0	-1.0	-1.0	-1.6	-0.2	-0.1	-0.2	-0.1
Month-wise power supply position of Andhra Pradesh during the year 2014-15 (in terms of energy)												
Requirement (MU)	9017	8110	4444	4213	4419	4095	4230	3881	4044	4193	4011	4541
Availability (MU)	7926	7541	3974	4023	4337	4050	3879	3820	4033	4191	4005	4534
Surplus (+)/Deficit (-) (MU)	-1091	-569	-470	-190	-82	-45	-351	-61	-11	-2	-6	-7
(%)	-12.1	-7.0	-10.6	-4.5	-1.9	-1.1	-8.3	-1.6	-0.3	0.0	-0.1	-0.2

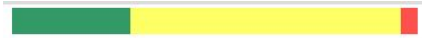
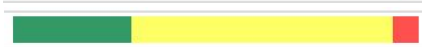
Source: Load Generation Balance Report

Table above illustrates, there was a deficit of 10% of power in April during peak demand and near about 14% in June. Even though the percentage of deficit is lesser in all other months, the state had a deficit power supply throughout the year.

The state of Andhra Pradesh has been procuring power from Andhra Pradesh Power Generation Corporation Ltd (APGenco), central government-run power generation companies like National Thermal Power Corporation Ltd (NTPC) and private sources.

The Feeder power supply status of Vajrakarur mandal, which is the project area, is provided in the table below. The 33 KV Substation for Ragulpadu, Potipadu and Konakondla, some of the villages covered under this project, is located at Vajrakarur.

Table 5-4: Power Supply status of villages covered in project area

Feeder	Power supply status	3 Phase	Single Phase	Power off
Ragulpadu		7 h	12 h	5 h
Pottipadu		7 h	16 h	1 h
Konakondla		7 h	15 h 30 m	1 h 30 m

Source: Andhra Pradesh power sector, daily power monitoring report. Data as of 31.08.2015

As per the data provided in the Table above, there is a huge power shortage to the tune of five hours in Ragulpadu village, and of 1-2 hours in Pottipadu and Konakondla villages of Vajrakarur mandal. Hence, the proposed project will be a boon to Andhra Pradesh which is facing acute power shortages. Table below provides the anticipated annual power supply position in Andhra Pradesh for 2015-16

Table 5-5: Anticipated Annual Power Supply Position in Andhra Pradesh (2015-16)

Anticipated Annual power supply position in Andhra Pradesh for 2015-16							
Energy				Peak			
Requirement	Availability	Surplus (+) / Deficit (-)		Demand	Availability	Surplus (+) / Deficit (-)	
(MU)	(MU)	(MU)	(%)	(MW)	(MW)	(MW)	(%)
54864	48216	-6648	-12.1	7622	6720	-902	-11.8

Source: Load Generation Balance Report

The expected power supply in Andhra Pradesh for 2015-16 in terms of energy is expected to have a deficit of 12.1%. During the months of June and July, there is a peak power deficit of almost 30%.

Figure 5-1: Anticipated Month-wise Power Supply Position in Andhra Pradesh (2015-16)

Month	Peak				Energy			
	Demand	Availability	Surplus(+)/ Deficit(-)		Requirement	Availability	Surplus(+)/ Deficit(-)	
	(MW)	(MW)	(MW)	(%)	(MU)	(MU)	(MU)	(%)
Apr-15	7,068	5,837	-1,231	-17.4	4,680	3,933	-747	-16.0
May-15	6,819	5,663	-1,156	-17.0	4,566	4,003	-563	-12.3
Jun-15	7,363	5,277	-2,086	-28.3	4,711	3,604	-1,107	-23.5
Jul-15	6,821	4,845	-1,976	-29.0	4,466	3,399	-1,067	-23.9
Aug-15	7,034	5,843	-1,191	-16.9	4,684	3,951	-733	-15.6
Sep-15	6,946	6,105	-841	-12.1	4,341	3,980	-361	-8.3
Oct-15	6,849	6,009	-840	-12.3	4,484	4,139	-345	-7.7
Nov-15	6,474	5,653	-821	-12.7	4,118	3,707	-411	-10.0
Dec-15	6,788	5,709	-1,079	-15.9	4,520	3,949	-571	-12.6
Jan-16	7,323	6,613	-710	-9.7	4,767	4,596	-171	-3.6
Feb-16	7,294	6,650	-644	-8.8	4,338	4,311	-27	-0.6
Mar-16	7,622	6,720	-902	-11.8	5,189	4,643	-546	-10.5
Annual	**7,622**	**6,720**	**-902**	**-11.8**	**54,864**	**48,216**	**-6,648**	**-12.1**

(Source: Load Generation Balance Report; Central Electricity Authority)

It can be inferred from Figure above that the power deficit scenario is expected to continue in 2015-16, with an annual deficit of more than 12%. During the months of June and July power deficit is almost 30%. Figure 5-2 and 5-3 below gives an account of the anticipated scenario demand vs availability of power in Andhra Pradesh for 2015-16.

Figure 5-2: Peak Power Demand vs Availability in Andhra Pradesh (2015-16)

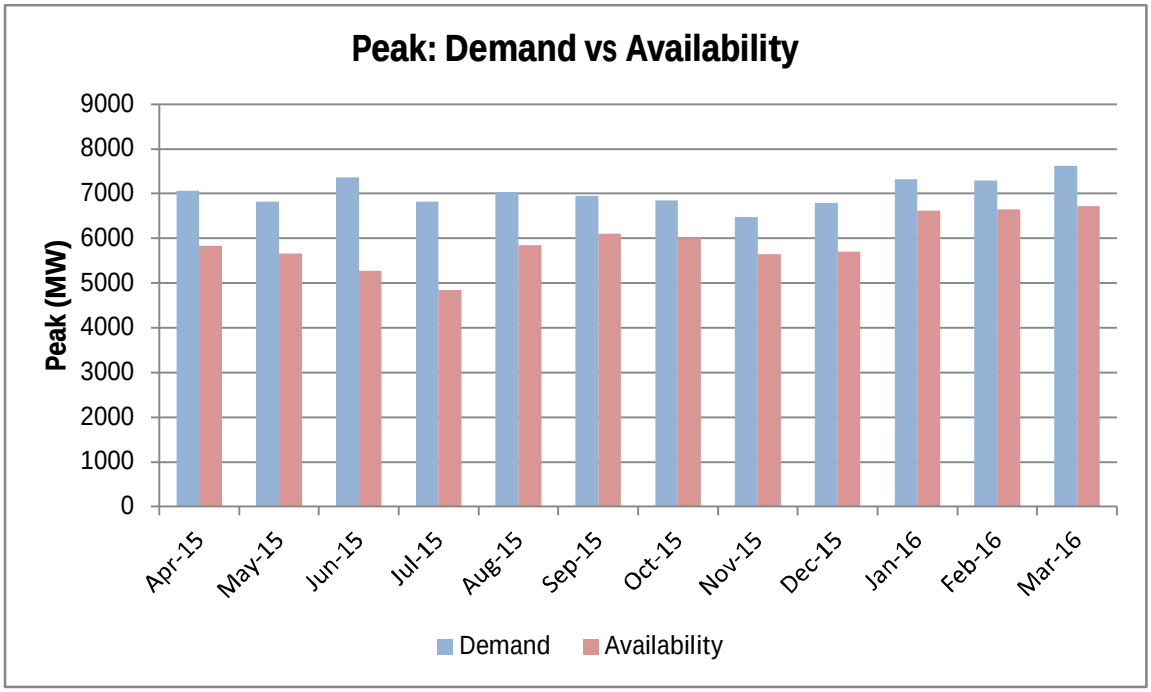
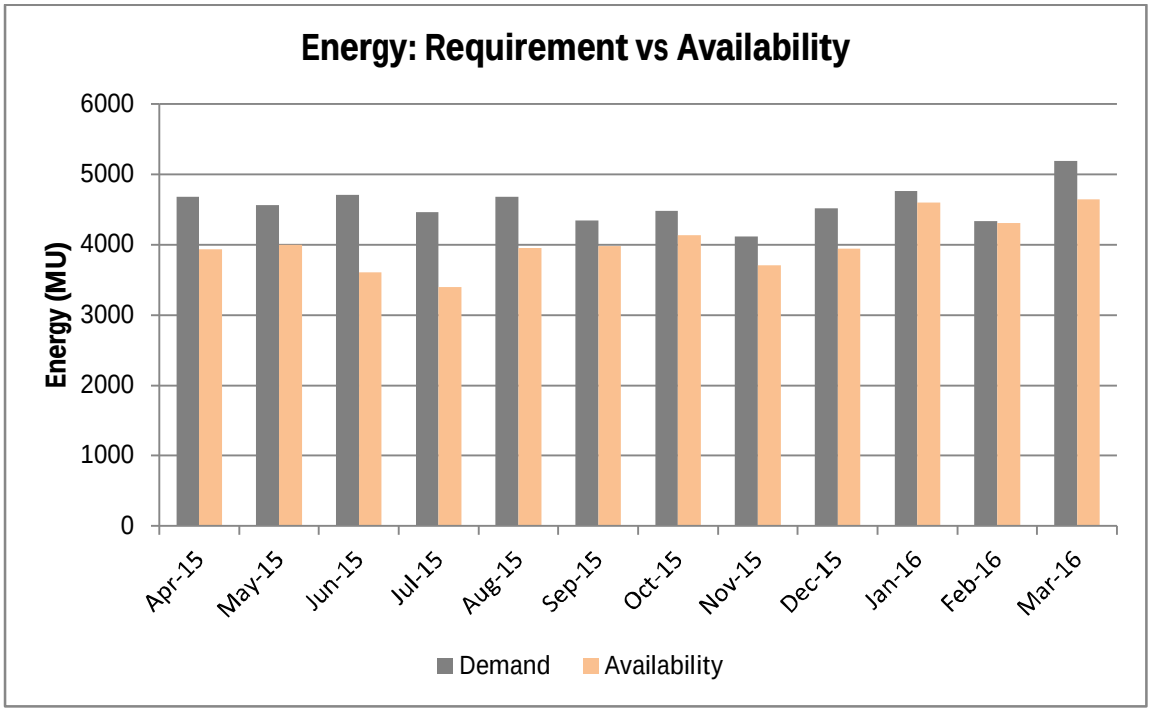


Figure 5-3: Energy Requirement vs Availability in Andhra Pradesh (2015-16)



Source: Load Generation Balance Report; Central Electricity Authority

It can be observed from Figure 5-2 and 5-3that the demand is always higher than the expected supply in all months, even though the deficit is highest during the months of June and July. From 14% deficit during the month of June in 2015, the percentage of deficit is expected to more than

double in the year 2016, to almost 30%. These numbers clearly indicate the anticipated energy deficit scenario in the state and the need for increased production of electricity.

Andhra Pradesh is one among the three pioneer states in the country where the state and central Governments have rolled out a Programme under the name "Power for All", aimed at providing access to electricity to each household, round the clock. This will lead to economic development of the state in primary, secondary and tertiary sectors resulting in inclusive development of the state. CRISIL (Credit Rating Information Services of India) had ranked Andhra Pradesh as No.1 based on the state's performance in power sector, among all the states in 2003.

The Wind Power policy of Andhra Pradesh mentions that the wind power projects are exempted from obtaining any NOC/Consent for establishment under pollution control laws from Andhra Pradesh Pollution Control Board. All approvals/clearances shall be disposed within 30 days from the date of registration. These are highly encouraging moves from the part of state Government to promote wind power generation in the state in an environmentally friendly manner, with a view to meet the growing energy demand.

Globally, India is the fifth largest producer of electricity but still an energy deficit nation and it is also estimated that around 295 million people today live in energy poverty in India. The requirement for more energy is quite apparent from these details and there is a huge significance for the proposed project, and hence the "No Project" scenario is not a viable option. Given the need to increase the energy supply in India, public sector investment has to be supplemented with contributions from private investors like MEIL, and it is easier in the current scenario with the existence of an investor friendly environment.

5.3 *Alternate Methods of Power Generation*

India is a large and fast growing economy, and according to Planning Commission of India, the country's primary energy use is expected to increase by four to five times by 2031-32. Even though India's energy basket has a mix of all resources such as coal, lignite, oil, natural gas, LNG, nuclear, hydro, and wind power, the dominance of coal is conspicuous with a prominent share of approximately 50%.

The efficiency of fuels is compared on the basis of their energy content and oil is considered as the standard for this comparison. One tonne of oil can generate 42 billion Joules or 10 Billion calories of energy whereas one tonne of Indian thermal coal can generate only 4.1 Billion calories. Thus 1 Mt of Indian coal is 0.41 Mtoe (Million tonnes of oil equivalent). Taking the thermal efficiency of the power plant and other losses in the system into consideration, in the case of coal-fired boilers, the equivalence between electricity and fossil fuels is 1 Billion kWh = 0.28 Mtoe. Electrical energy in kWh can be converted to kJ or kcal and can be expressed as Mtoe. One billion KWh of energy generated from wind power is equivalent to 0.086 Mtoe, since the intermediate stages of energy production don't generate any heat.

Table 5-6: Life-cycle Emissions from Power Sources

LCA Emissions ($g\ CO_2$ equivalent/kWh)	Wind	Solar	Nuclear	Coal
Implementation	13.7	37.5	1.2	3.6
Operation	4.7	12.0	12.4	918.8
Decommissioning	0.6	0.5	0.4	52.2
Total	19	50	14	975.3

Source: Report on developmental impacts and sustainable governance aspects of renewable energy projects, Ministry of New and Renewable Energy

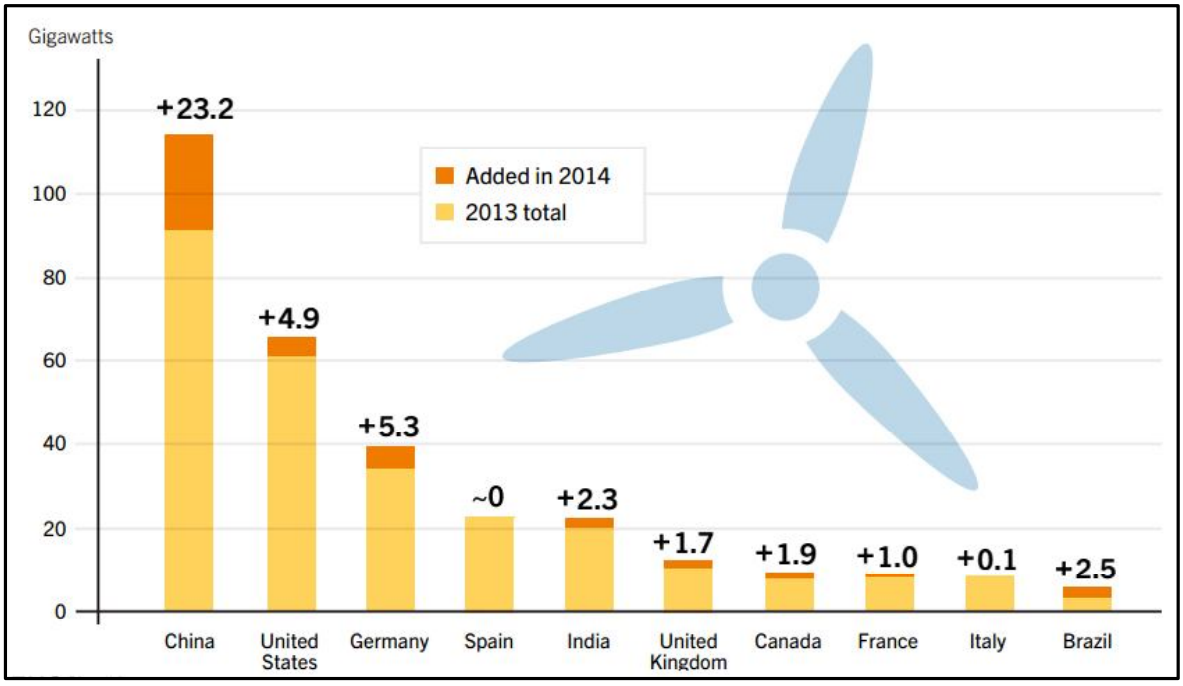
As evident from the Table above, the emission of CO_2 per kWh of energy generated from a Coal based power plant is more than 50 times that of the emission from a wind based power plant. The only emissions from the Renewable energy technologies are the emissions from fossil sources used in the production and manufacturing of equipment, waste disposal during construction, recycling etc. These life-cycle emissions are significantly lower as indicated in the table above.

As wind turbines don't produce any emissions that pollute the environment during its operation, unlike other power generating processes like burning of fossil fuels such as coal or natural gas, it is a clean fuel source and a power solution for remote areas like Anantapur. Wind is the only energy form which doesn't require water for the production of electricity and also the one which generates negligible amount of waste, i.e only during the construction period. A recent International Renewable Energy Association (IRENA) study found that countries like India would be able to greatly reduce water withdrawals and use in the electricity sector by increasing the share of renewables.

Over the past few years, the capital costs of wind power have declined, primarily through competition as well as through technological advances that have increased capacity factors. Onshore wind power is now cost-competitive, or nearly so, on a per kWh basis with new coal or gas fired plants, even without compensatory support schemes. (Source: Renewables 2015 Global Status Report). Turbine designs for use on- and offshore continued to evolve to improve wind's economics in a wider range of wind regimes and operating conditions.

Recognizing the importance of renewable energy and its role in sustainable development, the United Nations General Assembly declared 2014 the first year of a decade of Sustainable Energy for All (SE4All), which aims to double the share of renewable energy in the global energy mix from a baseline share of 18% in 2010 to 36% by 2030.

Figure 5-4: Wind Power Capacity and Additions, Top 10 Countries, 2014



Source: Renewables 2015 global status report

Figure 5-4 clearly points to the fact that as compared to developed nations such as China and United states, the wind power capacity addition in India is very less. Although India stands fifth in wind power generation, it generates less than 20% of China's wind energy production.

In India, the Ministry of New and Renewable Energy has announced generation based incentive for grid connected wind power projects. The total potential for wind power generation in the country as on 31.03.2014 is estimated to be 102772 MW, which is approximately 69.6% of the renewable power. The new Andhra Pradesh Government is keen to promote clean energy and has a welcoming approach towards wind power generation. The state's Wind power policies has always been generous and hence have always attracted the wind power companies for turbine siting to regions like Anantapur.

As per the prevailing Ministry of Environment and Forest laws, (the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 19, 2009), 38 activities are required to undertake environmental impact assessment studies. Since wind is one of the cleanest sources of energy, Environmental Impact Assessment study is not required for wind mill projects as there is no negative environmental impact due to the project activity. According to the International Renewable Energy Association (IRENA), wind power sector has generated 48,000 jobs (direct and indirect) in India.

Considering all the above mentioned favorable scenarios existing nationally and locally for wind power generation, there is no requirement of an alternative method. Wind power is the most suitable and environmental friendly option for power generation.

5.4 Alternate Location for the Project

The location of any wind based power generating project is finalised based on several factors which allow the project to operate in a technically and economically viable manner. Some of these factors include:

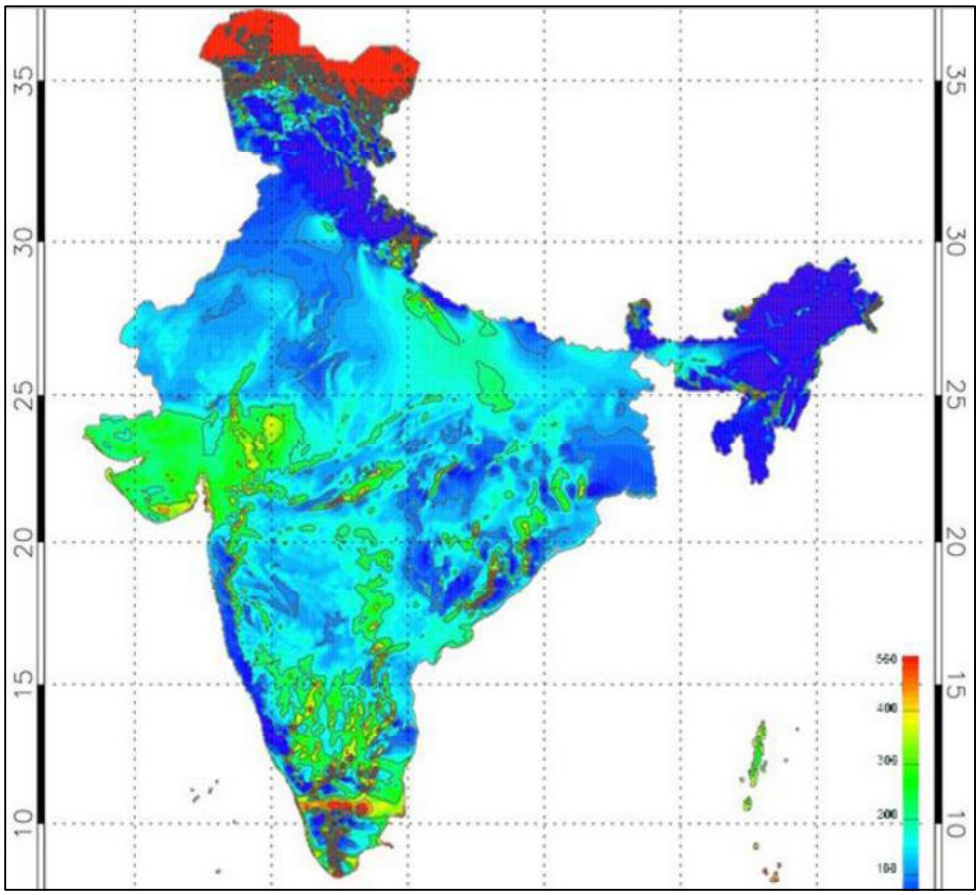
- Availability of optimum wind speed, which is the primary requirement for a wind power project
- The distance between the transmission line route and project area should be less, for easy transportation of energy
- No substantial negative impact on environment or socio-economic conditions of the region
- Ability to build the project on a site fulfilling national and state compliances

Andhra Pradesh Wind Power policy states that the wind power potential in the combined state of Andhra Pradesh as estimated by the National Institute of Wind Energy (NIWE), is around 14,497 MW at 80 m above ground level. It also mentions that a region like Anantapur is one of the ear-marked zones because of its high wind power potential. The region is dry as it faces scarcity of rainfall, wind is the only resource available, and farming is the main occupation of people in the region.

Andhra Pradesh is one of the States in India having windy locations, identified for wind power generation. While interviewing the forest official of Anantapur during site visit, he mentioned that there are no Reserve Forests, or any other ecologically sensitive areas around the region. Also, there was neither a requirement to relocate the native people nor any destruction of flora-fauna occurred as part of the project.

The local community of Vajrakarur has a positive approach towards upcoming wind energy projects in the region as there are similar projects by the same company as well as other companies, which have already made ingress into the neighbouring villages and are functioning without any encumbrance. They have helped improve quality of local infrastructure like construction of new roads. Apart from these factors, the villagers are of the expectation that such projects will elevate the standard of economy and provide them jobs like that of a security guard.

Figure 5-5: Wind Power Density map at 80 m level



Source: Data on estimation of Installable Wind Power Potential at 80 m level in India, National Institute of Wind Energy

5.5 Alternate Route for Transmission Lines

Even though the construction of transmission line has very less impact on environment and socio-cultural resources, this can be reduced by careful selection of route. The Transmission lines ferry electricity from Wind Turbine Generators to a 33/220 KV Suzlon Substation at Gadehothur village in Uruvakonda Taluk of Vajrakarur mandal and from these to the 132/33 KV Grid Substation at Guntakal. The multiple components that are interlinked with the selection of route for transmission lines include landowners' concerns, habitats of endangered species, airports, military bases, rivers or any other topographical or cultural features that could pose conflict. A careful multifarious approach is taken to reach a consensus on the routes that will do least damage and contain costs.

The following factors are generally considered while selecting the route for transmission line:

- The line should not infringe with any area of natural resources, forest lands etc
- Any route which has the presence of a monument of cultural or historical importance, community structures, or houses is exempted
- If selection of an area involves extensive removal of vegetation, that is averted.
- No environmentally sensitive sites are to be damaged during the process of installing transmission lines and access roads

- Right of way/access roads to the substation will be shared with local residents and other users
- The proposed route should not affect any public utility service such as schools, playgrounds, etc
- There should not be threat to the survival of any community especially Tribal population, while selecting the route

The client has met the owners of the land in person and has reached a consensus on selection of route for transmission lines, before acquiring land from them, and has paid a satisfactory compensation. Many of the routes are through barren land where no cultivation is happening, having least impact on environment, cultivable lands and vegetation. No habitations, community structures, or residential areas are damaged.

Hence, after taking all the above factors into consideration, the shortest possible route which is economical from the point of view of construction and maintenance and which creates the least environmental and social footprint was chosen.

5.6 Conclusion

United Nation's Intergovernmental Panel on Climate Change (IPCC) has projected that renewable energy can provide approximately 77% of global primary energy supply by 2050. The state level incentives provided by the new government of Andhra Pradesh are attractive enough to influence the wind power companies.

As mentioned in the sections above, the project has many advantages like elevating the standard of rural economies, increasing the power supply of the energy deficit state of Andhra Pradesh in an environmentally friendly manner. Hence, the project with all the chosen options – site, mode of power generation, route of transmission line etc., is the appropriate alternative and is beneficial for the region.

6. SOCIO-ECONOMIC ENVIRONMENT

6.1 Introduction

The social baseline chapter of the report provides a demographic, cultural and economic overview including the description of the physical infrastructure and amenities available in the Social Study Area. The purpose of presenting this information is to provide baseline data of the Project villages in the social study area for conducting the impact assessment and to monitor and measure changes against the potential future changes to the Social Study Area due to the presence of the Project.

Data from secondary sources like the Primary Census Abstract of 2011, Percentage of Households to Total Households by Amenities and Assets Human of 2011 and Human Development Report of Andhra Pradesh, 2007 have been utilised to profile the socio-economic condition of the community.

6.2 Project Area

In terms of project area, the project WTGs and the other project components such as the material yard, pooling substation, transmission lines and the access routes are spread across Seven (7) villages namely, *Thatrakal, Vajrakarur, Gade Hothur, Pottipadu, Gulapalem, Konakondla* and *Kamalpadu* (hereinafter referred to as *'Project Villages'*) in Vajrakarur Mandal of Anantapur district. Table below presents the total number of households and the population in the project area.

Table 6-1: Population details of Project Area

S. No	Area	Total Households	Total Population
DISTRICT			
1.	Anantapur	968160	4081148
MANDAL			
2.	Vajrakarur	11186	50007
VILLAGES			
3.	Thatrakal	719	2986
4.	Vajrakarur	1688	7925
5.	Gade Hothur	510	2392
6.	Pottipadu	245	1032
7.	Gulapalem	571	2475
8.	Konakondla	2534	11382
9.	Kamalpadu	403	1785

Census of India, 2011

It can be seen from the above table that Vajrakarur Mandal is entirely rural in setting with an average of 4-5 person per household.

6.3 Baseline Conditions

6.3.1 District Profile

Anantapur District is the southernmost district of the Rayalaseema region of Andhra Pradesh, India. Being located in the rain-shadow region of Andhra Pradesh, the district is drought-prone. It is bounded on the north by Kurnool District, on the east by Kadapa District, on the southeast by

Chittoor District, and on the southwest and west by Karnataka state. The district can be divided into three natural divisions with black soils in the north, arid and poor red soils in the central part and average sandy red soils to the south.

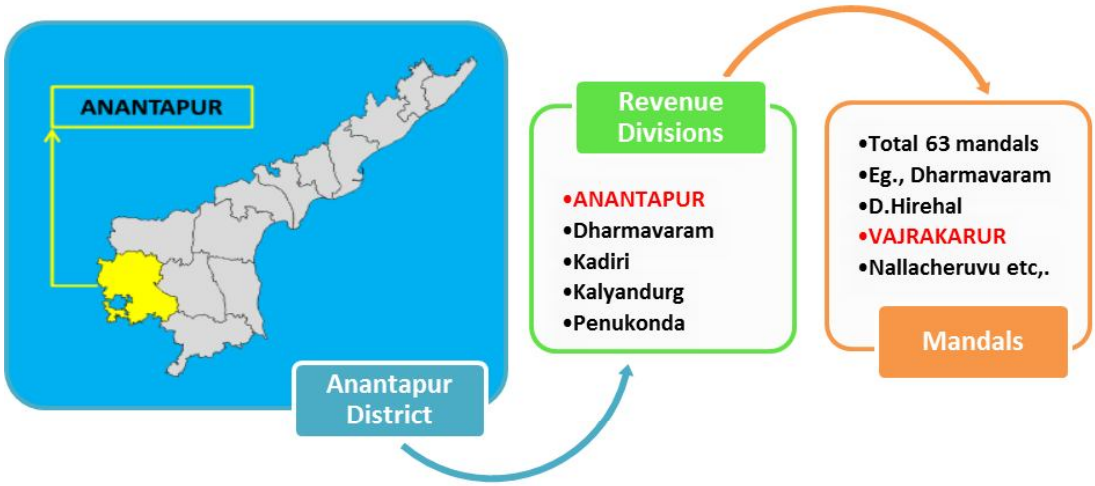
As per Census 2011, Anantapur district has a population of 40.83 lakhs and a population density of 190 persons/sq. km which is growing at a decadal growth rate of 12.2% from 2001. Anantapur district is largely dominated by rural population comprising of 72% of the total district population. The district has a literacy rate of 56.1%, which is lower than the literacy rate of the state (literacy rate of 61%). Male population with nearly 68 % literacy rate dominates the literate population in the district. Also, Anantapur has nearly 9.7 lakhs households with an average household size of four to five members.

Agriculture remains the predominant activity in the villages, with 80% of total workers engaged in agriculture, either as cultivators or agricultural labourers.

6.3.2 *Administrative Structure*

For administrative purposes, the district is divided into five (5) revenue divisions, namely, Anantapur, Dharmavaram, Kadiri, Kalyandurg and Penukonda; these revenue divisions are further divided into 63 Mandals (Talukas/Tehsils). Anantapur district includes 866 villages.

Figure 6-1: Administrative Structure of Anantapur District



6.3.3 *Social Study Area*

The social study area for the proposed project comprises of project villages; which are likely to be affected by the project activities during the pre-construction, construction, operation and decommissioning phases.

6.3.4 *Demographic Profile*

This section of the report provides a description of the demographic characteristics of the social study area. The demographic characteristics described below include population and growth, ethnicity and caste, literacy, land holding and occupational pattern.

Table 6-2: Population details of Project Villages

S. No	Area	Total Population	Gender Distribution		Total Households
			Male	Female	
1.	Thatrakal	2986	1475	1511	719
2.	Vajrakarur	7925	3925	4000	1688
3.	Gade Hothur	2392	1256	1136	510
4.	Pottipadu	1032	524	508	245
5.	Gulapalem	2475	1287	1188	571
6.	Konakondla	11382	5709	5673	2534
7.	Kamalpadu	1785	916	869	403

Census of India, 2011

In the Social Study Area, the population size varies from 11,382 (Konakondla) which is amongst the highest and 1,032 (Pottipadu) which is the lowest amongst the project village population as indicated in Table above. Also, it can be observed that, near about equal numbers of male and female population reside within the project villages.

6.3.5 Literacy

Literacy, as defined in Census data, is the ability to read and write with understanding in any language and literacy rate is a key indicator of the level of education prevalent amongst the sample population. It is also considered as one of the key factors of socio-economic progress.

Table 6-3: Literacy details of Project Villages

S. N	Area	Literate (%)		Illiterate (%)	
		Male	Female	Male	Female
1.	Thatrakal	4.5	3.1	5.3	7.0
2.	Vajrakarur	17.6	13.0	8.5	13.7
3.	Gade Hothur	4.7	2.6	3.6	5.0
4.	Pottipadu	2.0	1.3	1.5	2.1
5.	Gulapalem	5.7	3.6	2.8	4.4
6.	Konakondla	21.7	15.4	16.3	22.5
7.	Kamalpadu	3.0	1.7	3.1	4.1
	Total	**59.2**	**40.8**	**41.2**	**58.8**

Census of India, 2011

The overall literacy rate in the social study area is observed to be 59.2% for males and 40.8% for females as per census records of year 2011. This reflects a wide gender disparity of 19 percentage points in literacy levels. Amongst all the seven (7) project villages highest literacy was observed in Konakondla and Vajrakarur Villages and lowest in rest of the project villages namely, Thatrakal, Gade Hothur, Pottipadu, Gulapalem and Kamalapadu.

Similarly, the illiteracy rate in the project villages was observed to be higher among the females (about 58.8%) as compared to males at 41.2%.

During consultation in the project villages, it was reported that the younger generation has access to schools and better educational opportunities in their own villages or neighbouring villages and hence the older generation are more interested in educating their children. Although, there are no evidences of gender disparity in terms of working for livelihood and access to basic amenities, it was

reported by the headmaster of the high school in Gade Hothur village that girl students after a certain age group (>12 years old) tend to drop out of school due to reasons like attainment of puberty and household responsibilities.

6.3.6 Presence of Vulnerable Communities in the Project Villages

Social Status

IFC Performance Standard 7 (Indigenous Peoples) recognizes 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.

Vulnerable communities are considered on the basis of different factors such as below poverty line (BPL) families as identified by the state government, women headed households, family with members who are mentally or physically challenged, small land holdings (less than minimum land holding status of concerned district), families with principal earning members above the age of 60 years, and Scheduled Caste (SC) and Scheduled Tribe (ST) families.

The Scheduled Castes (SCs) and Scheduled Tribes (STs) are social groups explicitly recognized by the Constitution of India. They are legal categories roughly coinciding with those who are dalits/untouchables and adivasis and are considered to be marginalised in the development process.

There are about 61 identified Schedule Caste (SC)[6] population and 35 identified Schedule Tribe (ST)[7] in the state of Andhra Pradesh. Commonly existing schedule caste group namely, Madiga and Mala population are the most prevalent Caste in entire Anantapur district.

As seen from the Table below, the schedule caste and schedule tribe population in the project villages account for less than 50% of the total population. Three (3) out of the Seven (7) project villages namely, Gade Hothur, Pottipadu and Gulapalem have no schedule tribe population.

Table 6-4: Schedule Caste and Schedule Tribe Population details of Project Villages

S. No	Area	Population Schedule Caste (%)	Population Schedule Tribe (%)
1.	Thatrakal	9.0	41.8
2.	Vajrakarur	21.1	3.6
3.	Gade Hothur	12.8	0.0
4.	Pottipadu	36.2	0.0
5.	Gulapalem	11.3	0.0
6.	Konakondla	18.1	1.0
7.	Kamalpadu	9.6	9.9

Census of India, 2011

[6] Ministry of Social Justice and Empowerment, GoI
[7] Ministry of Tribal Affairs, GoI

Poverty Level

Poverty line is the economic benchmark used by Government of India to indicate economic disadvantage and to identify individuals and families in need of Government assistance and aid. A person is defined as poor if his/her average income/consumption is less than a pre-determined threshold. As per Planning Commission Poverty Estimates 2011-12, the rural poverty line for Andhra Pradesh lies at ₹ 860 monthly per capita and 10.96% of the rural population of Andhra Pradesh fall below this line.

During the consultation in the social study area, it was observed that the land owners do not belong to vulnerable community of the society. Although most of families belonged to schedule caste (as recognized by the Constitution of India) families, they are part of the mainstream population in the area.

6.3.7 Land Holding Pattern of the Area

Land holding pattern is the main source of information on basic characteristics of operational holdings such as land use, cropping patterns and irrigation status etc. In order to evaluate whether an area is economically affected, it is necessary to understand the land holding pattern of the area.

The land holding pattern of the project mandal i.e., Vajrakarur as per the Agricultural Census 2010-11, has been presented in the Table below:

Table 6-5: Land holding Pattern in the Project Mandal

S.N.	Size of Holding (in ha.)	Individual Holdings		Joint Holdings		Institutional Holdings		Total Holdings	
		Number	Area	Number	Area	Number	Area	Number	Area
VAJRAKARUR MANDAL									
1.	Marginal	4262 (26.3)	2835 (9.1)	0 (0)	0 (0)	7 (10.9)	4 (0.9)	4269 (26.2)	2840 (8.9)
2.	Small	6591 (40.6)	9625 (30.9)	0 (0)	0 (0)	1 (1.5)	1 (0.2)	6592 (40.4)	9627 (30.5)
3.	Semi Medium	4134 (25.4)	10546 (33.9)	0 (0)	0 (0)	15 (23.4)	45 ()	4149 (25.4)	10591 (33.5)
4.	Medium	1104 (6.8)	6367 (20.4)	0 (0)	0 (0)	29 (45.3)	187 (14.33)	1133 (6.9)	6554 (20.8)
5.	Large	135 (0.8)	1764 (5.6)	0 (0)	0 (0)	12 (18.7)	186 (48.41)	147 (0.9)	1950 (6.2)
	Total	**16226 (100)**	**31138 (100)**	**0 (0)**	**0 (0)**	**64 (100)**	**424 (100)**	**16290 (100)**	**31562 (100)**

Source: Agricultural Census 2010-11

Figures in brackets are percentages to total

As per the Agricultural Census 2010-11, the operational holdings have been classified into five groups based on land area in hectares (ha) viz., marginal (0-1 ha), small (1-2 ha), semi-medium (2-4 ha), medium (4-10 ha) and large (10 ha and above). The operational holder of the land is a person who has the entire responsibility for operating the agricultural holding and is classified as an individual, joint owner and an institution.

The small and semi-medium operational holdings (i.e., holdings with size 1-4 ha) constitute majority of the area of operational land holdings in the project mandal. Large holdings with holding size of >10 ha constitute of only 5.6% of the total area.

During the social survey, it was reported that the average land holding in the social study area ranges from less than 4 to 18 acres per family/household.

6.3.8 Common Property Resource

Land is an important natural resource of fodder and fuel wood for villagers in the social survey area. Most of the household has livestock as a secondary source of livelihood. . In social study area, most of cultivable area covers only one season cropping pattern of Kharif crops based on rain water (monsoon) irrigation. Tuar dal (*Cajanus cajan*) and ground nut (*Arachis hypogaea*) are major crops of Kharif seasons cultivated in social study area.

The proposed turbine locations comprise of rain-fed agricultural lands with patches of dry vegetation and shrubs used as grazing land by livestock such as sheep and goats. However, the project will not restrict the grazing activities in and around their proposed project turbine lands. The project therefore does not impact the common property resources of the villagers.

6.3.9 Occupational Pattern of the Area

The occupational pattern of the local population is an important aspect describing the economic and livelihood activities of the social study area. As per Census 2011 statistics, it can be seen that out of the total 16089 number of working population in the social study area, 82.9 % of the population are main workers and about 80.9 % are marginal workers as compared to 80.9% of main and 19.2% of marginal workers in entire Vajrakarur mandal. The details of the employment profile in the project area in comparison to that at mandal level have been illustrated in the Table below:

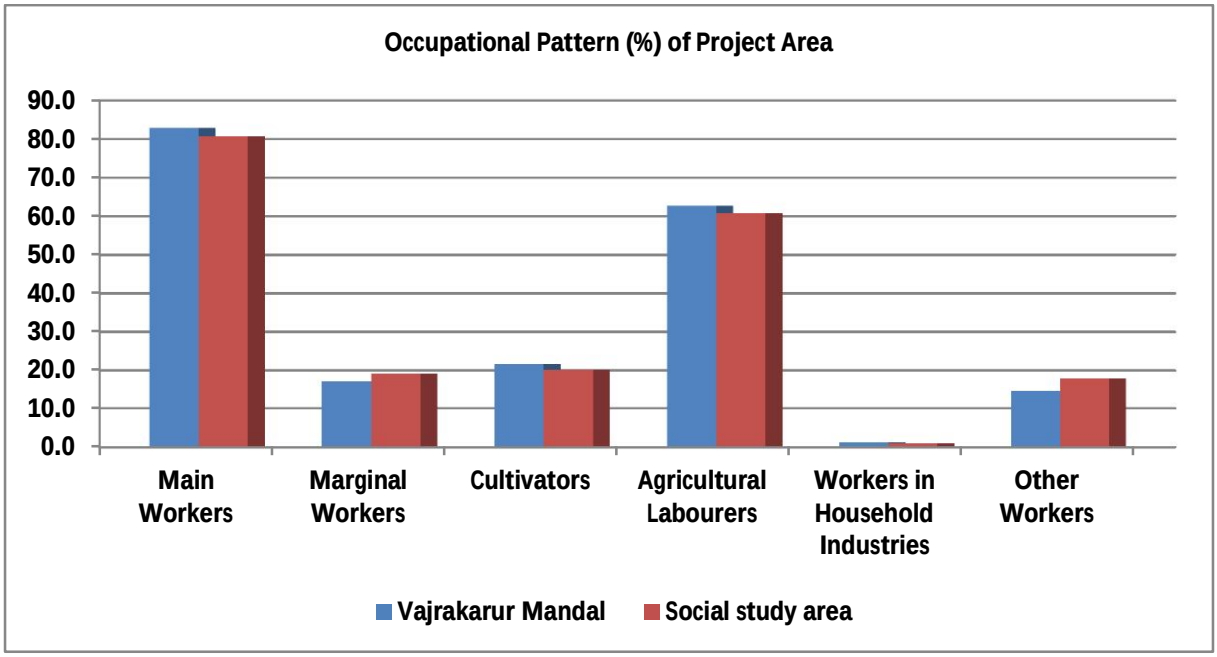
Table 6-6: Occupational Pattern of the Project Area

Area Classification of Workers	Vajrakarur Mandal	Social Study Area
Main Workers	23106	12992
Marginal Workers	4776	3097
Total Workers	27882	16089
Non-Workers	22125	13888
Cultivators	6054	3257
Agricultural Labourers	17480	9767
Workers in Household Industries	330	170
Other Workers	4018	2895

Source: Census of India 2011

It can be inferred from the table that out of the total working population in the social study area in 2011, approximately 20% are cultivators, 61% are agricultural labourers, 1% are engaged in household industries and 18% are other workers. The occupational pattern statistics have been illustrated in Figure below.

Figure 6-2: Occupational Pattern of the Project Area



During social survey, it was observed that the predominant occupations of the local residents are agriculture based livelihoods such as cultivation and agricultural labourers and livestock rearing.

Cultivation and agricultural labourer works is undertaken equally by both men and women. The agricultural works includes ploughing, seeding, weeding, harvesting, transportation and storage of the crops. The crops are mainly rain-fed, and where agricultural land is in close proximity to permanent or seasonal water source irrigation occurs.

6.3.10 Role of Women in Workforce Participation

Women are primarily responsible for domestic and household chores. Also, women are responsible for clearance and maintenance of their own agricultural fields and many of them work as agricultural labourers in others fields also.

As per Census 2011 statistics, it can be seen that out of the total 7,179 number of female working population in the social study area, 75.6 % of the population are main workers while only 24.3% are marginal workers. The details of the employment profile of females in the project area in comparison to that at mandal level have been illustrated in the Table below:

Table 6-7: Occupational Pattern of the Project Area

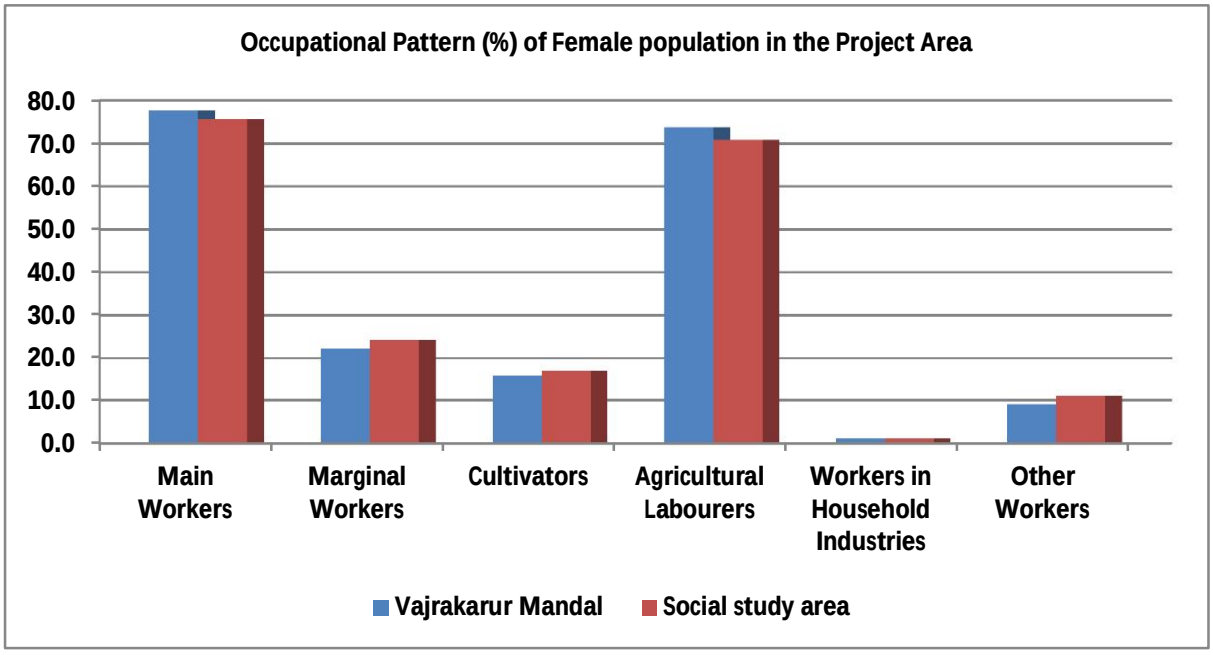
Area / Classification of Workers	Vajrakarur Mandal	Social Study Area
Main Workers	9884	5433
Marginal Workers	2827	1746
Total Workers	12711	7179
Non-Workers	11982	7706
Cultivators	2034	1221
Agricultural Labourers	9377	5087

Area / Classification of Workers	Vajrakarur Mandal	Social Study Area
Workers in Household Industries	144	77
Other Workers	1156	794

Source: Census of India 2011

It can be inferred from the table that out of the total number of female working population in the social study area in 2011, approximately 17% are cultivators, 71% are agricultural labourers, 1% are engaged in household industries and 11% are other workers. Therefore, it can be inferred that the majority of the female working population in the project villages involved as agricultural labourers in the fields. The occupational pattern statistics have been illustrated in Figure below:

Figure 6-3: Occupational Pattern of Female population in the Project Area



During social survey, it was reported that women in the social study area are actively involved in cultivation, agricultural labourers and household chores. In addition to daily household chores and agricultural work, women in these villages are involved in other income generating occupations such as tailoring jobs, running kirana shops and selling of milk produced from the livestock. Some females were reported to be employed in contractual jobs such as road sweeping and agricultural labourers issued under the provisions of the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA).

6.3.11 *Existing Infrastructural Facilities*

Presence of adequate infrastructural facilities in any area is indicative of the prosperity and economic status of that area. Infrastructural facilities include provision of educational, healthcare, drinking water supply, roads and communication facilities for local residents of the area.

➢ *Educational Facilities*

All the project villages have access to at least one primary school within a 2 km radius, and a secondary school (till 10th std.) within an 8-10 km radius. There are government and private colleges, technical institutes and vocational training centres at Guntakal and Vajrakarur town.

During social survey, a secondary government school in Gade Hothur village was visited. It was reported that there are around 12 high school teachers and 5 primary class teachers in the school. The head of the school raised a concern regarding decline in the number of girl students after a certain age (>12 years old) as they tend to drop out of school due to reasons which includes attainment of puberty and household responsibilities.

Photo 6-1: High School in Gade Hothur Village

Photo 6-2: Primary School in Pottipadu Village

➢ *Healthcare Facilities*

All the project villages have access to at least one Primary Health Centre (PHC) or a Community Health Centre (CHC) within a 2 km radius. However it was reported that these centres are not functional round the clock, and designated doctor is available only when there is an emergency. The local residents of the project villages prefer to visit government and private hospitals at Vajrakarur and Guntakal in case of any major illness including surgeries and child births.

During social survey, a primary health centre locally called as the *"Prathamika Aarogya Kendramu"* was visited. It was reported that Doctor is available on request during emergencies and two (2) full time nurses are available 24X7. The PHC had provision of admitting 4-6 patients at one time. Two (2) patients with complaints of stomach ache and mild temperature were seen to be waiting.

Photo 6-3: Prathamika Aarogya Kendramu in Gade Hothur Village

During the consultation process women folks reported to have access to government health workers/nurses coming to the villages for immunizing the children. The state run 108 Emergency Ambulance Service is fully functional in the area, with the ambulances reaching the point of emergency within its' mandatory 15 minute limit.

- *Economic facilities*

Vajrakarur mandal has a cooperative bank with an ATM. Nearest town of Uravakonda and Anantapur city were observed to having branches of Nationalised banks as well (State bank of India, Union bank of India and Bank of India).

As reported during the consultation, women in the villages are involved in income generating occupations such as tailoring jobs, running kirana shops and selling of milk produced from the livestock. However, these are result of any financial support from any self-help groups. Women in the villages carry of these small businesses out of their interest and need.

- *Water Supply facilities*

All the project villages have access to drinking water in the form of government tap water and piped water supply from Sri Sathya Sai Drinking Water Supply Project. It was reported that water from the government supplied tap water is used for domestic purposes and Sri Sathya Sai water supply is used for drinking purpose. The project's drinking water supply is sourced from surface water from the Tungabhadra Canal.

Anantapur district being one of the most arid districts in the state, three of its major rivers flowing through the district are non-perennial and remain dry during summer months. Therefore, irrigation in the project villages was reported to be performed during the rainy season of the year. However, recently the *Handri-Neeva Sujala Sravanthi* (HNSS) project serves the district in irrigating around four lakhs acres of land.

Photo 6-4: Sri Sathya Sai Drinking Water Tank in Gade Hothur Village

- *Sanitation Facilities*

Although the entire Anantapur district is covered under *"Nirmal Bharath Abhiyn"* – a sanitation scheme and have contributed to a significant improvement in the district by setting up toilets in schools, Anganwadis and rural households. However, during consultations it was evident that local population do not prefer use of toilets set up in their households due to lack of continuous water supply. Open defecation is reported in the project villages which can be linked to the many of common diseases reportedly prevalent in the project villages including gastrointestinal diseases, typhoid, malaria and snake bites.

- *Approach road and Communication Facilities*

All the project villages are well connected by paved and compacted village roads. Government and private bus services are available in all the project villages. Major towns in the area are connected to the district headquarter or nearest city of Bangalore and Hyderabad through well maintained toll roadways (National Highway). The nearest railway station is at Guntakal town located at a distance of about 25 km. Therefore, it can be concluded that the area is well connected and approachable through railways and paved roads.

During the site survey it was observed that the project villages are well connected by 2 lane undivided carriage roads with bus facility for twice a day and share-auto rickshaw/van facility to reach the nearest town and other villages. Other than that, local residents were also observed to own bicycles and two wheeler vehicles.

Each of the project villages were observed to be well connected through adequate communication facilities such as cellular phones and Digital televisions. However, disruption in continuous power supply of 6-8 hours/day is reported in all the project villages.

6.3.12 *Existing Land Use Pattern*

➢ *District Level*

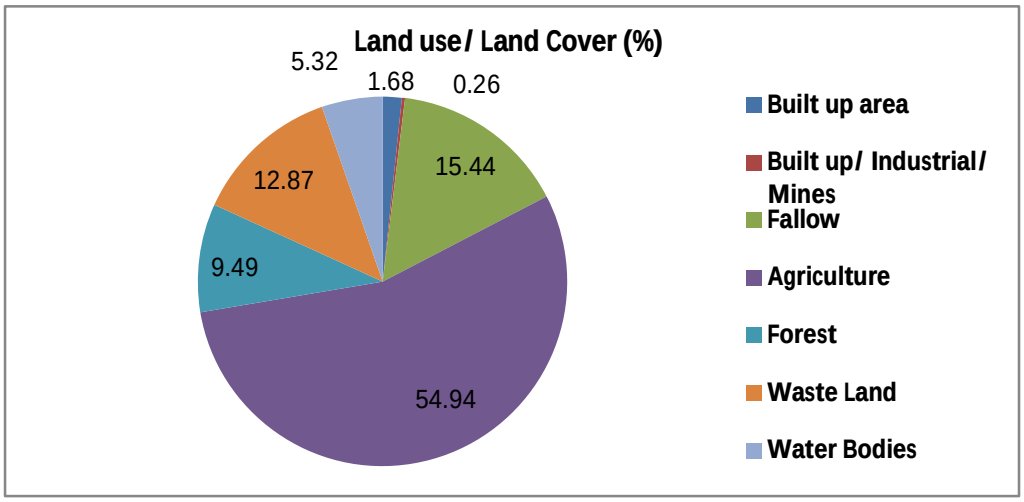
The major land use of the Anantapur district is agricultural which is spread throughout the district. As per Andhra Pradesh state statistical abstract released by Planning Department in May 2014, the major land use of the Project district is Agriculture (54.94%) followed by fallow (15.44%) and waste land (12.87%). Forest cover comprises 9.49% of the total geographical area of Anantapur District.

Table 6-8: Land Use/Land Cover of Anantapur district

Land use category	Area in Sq km	Percentage (%)
Built up area	321.1	1.68
Built up/ Industrial/ Mines	49.8	0.26
Aquaculture	0.00	0.0
Fallow	2954.6	15.44
Agriculture	10510.2	54.94
Forest	1816.1	9.49
Waste Land	2461.9	12.87
Water Bodies	1017.0	5.32
Wetlands	0.0	0.0
Total Geographical Area	**19130.6**	**100**

Source: Andhra Pradesh State Statistical Abstract (2011-2012)

Figure 6-4: Land Use/Land Cover of Anantapur district



Source: Department of Agriculture, District Anantapur, Government of Andhra Pradesh

➢ *Project Area*

The project area can be characterised by undulating land with an average elevation in the range of 455 to 480 m above mean sea level (amsl) and comprises predominantly of rain-fed agricultural land. Proposed site is located in rural set up and land use pattern of the surrounding area comprises of fallow land followed by irrigated land and barren land at few project locations.

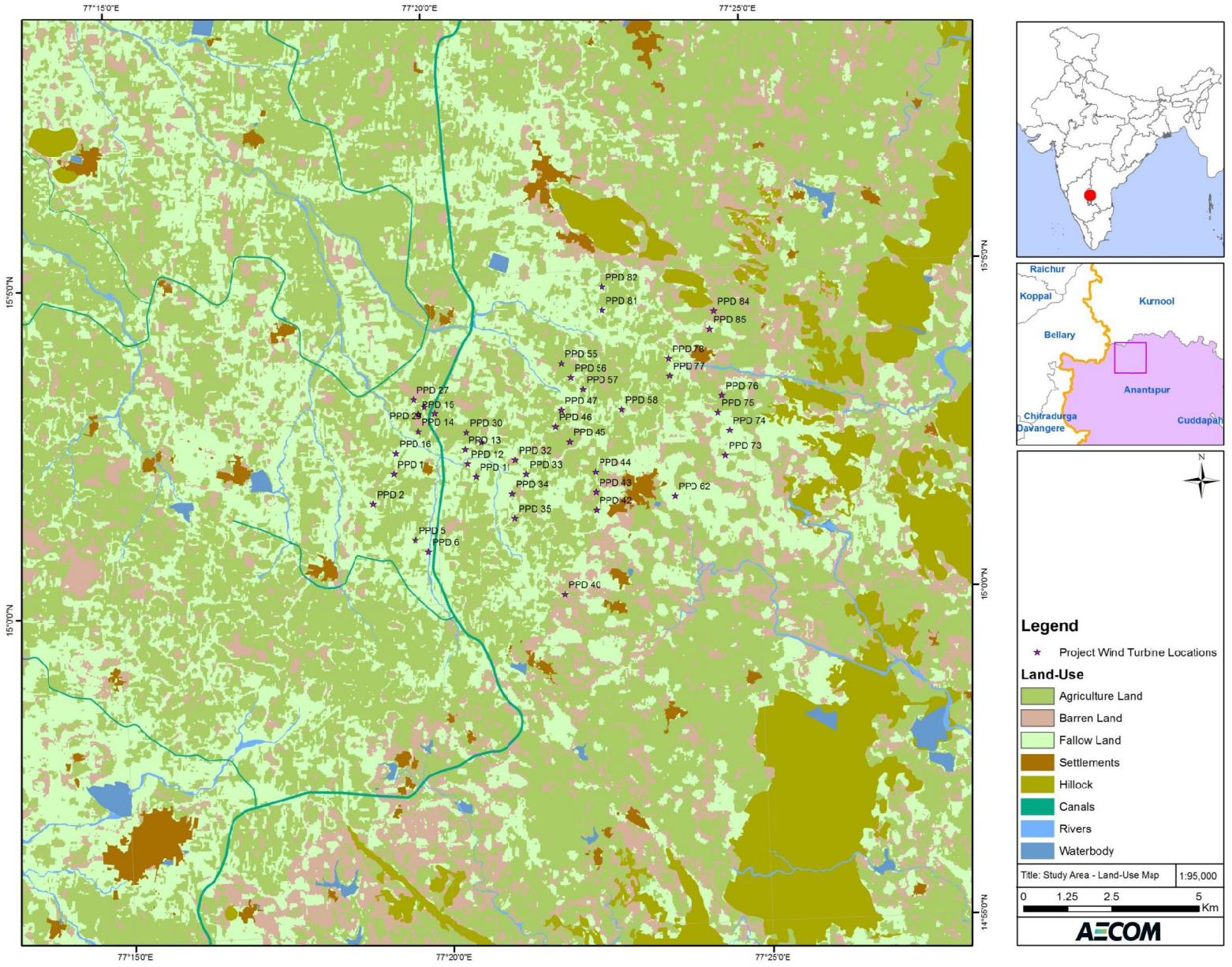
The land use analysis depicts that the major land use in the study area is agricultural land (~47%) followed by Fallow land (~27%) and barren land (~12%). The land use pattern of the study area is presented in below:

Table 6-9: Land Use Pattern in the Project Area

Type of Land use	Area in Sq. km	Percentage (%)
Agriculture Land	332.7895	47.14
Fallow Land	195.2453	27.66
Barren Land	87.1796	12.35
Settlements	11.4100	1.62
Hillock/Rocky Land	63.0913	8.94
Canal	4.4419	0.63
River	6.7840	0.96
Waterbody	5.0553	0.72
Total Area	**705.9968**	**100.00**

Source: AECOM

Figure 6-5: Land Use Map of the project area



6.4 Stakeholder Consultation

Wind power projects in general involves land procurement which can either be private or revenue and hence, community consultation plays an important role to register the concerns and perception of the local community which directly or indirectly is going to be influenced due to the commencement of the project in the area. As discussed in *Chapter 2*, a social perception survey and consultation was undertaken by AECOM to appraise the socio-economic status of the social study area, their livelihood pattern and the existing village amenities.

Stakeholder Consultations provide inputs to safeguard public interest in the course of project execution and operational stages. It allows a two-way exchange of information between the consultants and potentially influenced land owners and population residing in the social survey area. The consultation helps to ensure concerns regarding the project are identified early and in a transparent manner. IFC Performance Standards require the project proponent to undertake consultation with land owners and other concerned stakeholders and facilitate their informed participation in the project. Also, the ADB Safeguard Policy and the IFC Performance Standards both require the project proponent to undertake consultation with potential influenced land contributors and other concerned stakeholders and facilitate their informed participation in the project. The following *Table 6-8* gives the details of meeting conducted during site visit and the list of participants.

Table 6-10: Details of the meeting conducted during site visit

Date	Name of the Village	List of Participants
Suzlon Representatives – Land & project Team		
27.08.2015	Suzlon's project office	Mr. Bala Mr. Venkata Rao
Land Aggregator – M/s. Chella Land Developers		
27.08.2015	Suzlon's project office	Mr. Chella Anjaneyulu
Land Contributors includes Women Owners		
27.08.2015	Gade Hothur	Mr. Satyanarayan Shetty
27.08.2015	Vajrakarur	Ms. M. Chandrakala, w/o G.Lalappa, Mandal President
27.08.2015	Gulapalayam	Ms. Ganga, w/o Naagesh
27.08.2015	Pottipadu	Ms. Lakshmi, w/o Anjaneyulu
27.08.2015	Vajrakaru	Mr. Obulesu
27.08.2015	Gade Hothur	Mr. Vannur Swamy, Panchayat Vice President
27.08.2015	Kamalpadu	Mr. Sreenivasan
27.08.2015	Pottipadu	Mr. Venkatesh
27.08.2015	Vajrakarur	Mr. B. Madhusudan Reddy
27.08.2015	Gudapalem	Mr. T. Ramesh
Women Respondents		
27.08.2015	Vajrakarur	Ms. M. Chandrakala, w/o G.Lalappa, mandal President
27.08.2015	Gulapalayam	Ms. Ganga, w/o Naagesh
27.08.2015	Pottipadu	Ms. Lakshmi, w/o Anjaneyulu
28.08.2015	Vajrakarur	Local Female Residents (Did not share names)
Local Inhabitants/Villagers		
28.08.2015	Pottipadu Primary School Teacher	Mr. G. Sreeramlu

Date	Name of the Village	List of Participants
28.08.2015	H.M China Hothur School Principal	Mr. M.N. Shaheen
28.08.2015	H.M China Hothur School Assistant	Mr. Rehmathalla
28.08.2015	Vajrakarur – Tea Shop Owner	Mr. H. Dadavali
NGO working in the area		
28.08.2015	Rural Development Trust (RDT)	Dr. Hari, Projects Director

Informal Interviews were conducted with Suzlon representatives (both Land and project team), Land Aggregator, land contributors/owners, group of women and representative of RDT – an NGO working in the area. Also, questionnaire consultations were conducted with randomly selected local inhabitants/villagers from the project villages.

6.5.1 Suzlon Representatives and Land Aggregator

The land aggregator is responsible for land procurement and obtaining necessary statutory approvals for the project. The Land team from Suzlon oversees the land transaction and works in coordination with the land aggregator. M/s. Chella approaches and engages in informal consultations with interested land owners on individual basis.

A total of about 149.5 acres of land @ of 2.99 acres per WTG is required for the project turbine locations. Sale deeds for 41 WTGs were executed with individual land sellers as on 30th September, 2015. The pooling substation is constructed in 21.5 acres of private rain-fed agricultural land falling in Gade Hothur Village, which was purchased in the year 2011 by Suzlon. The details of the land procured for the project along with the landowners name have been presented in Table 6-11.

M/s. Chella has been engaged in informal consultations and discussions at the village level and individual level. The local community and the individual land owners have been briefed about the project including details of the tentative location of wind farm, general details about wind farm, need for land and general compensation terms and generation of employment was discussed with villagers . Individual and group meetings were organised with smaller groups to address their queries related to the following issues:

- Unit rate for purchase of land;
- Access to temple (in case of any within the identified land);
- Schedule for construction and phases of construction; and
- Employment opportunities

On an average, INR 6 lakhs per acre has been paid to each land owners on "willing buyer/willing seller" arrangement. The land rates paid is three (3) times higher than the prevailing market rates (INR 80,000-2, 00,000 per acre). The land sellers have voluntarily sold their land for the proposed project. As on the day of site visit, the registration process was ongoing and is expected to be completed by the month of November 2015.

During the discussions with the project team from Suzlon, it was reported that labour requirement at site will range from 50-60 during normal and 70-100 workers at peak operations and majority of them will be employed from the local villages and hence there was no provision of camp site at the construction site. Also few skilled workers from other parts of the country will be hired and shall reside at rented rooms in the neighbouring villages. It was also reported that issues regarding

migrant workers was negligible at this site since locals are aware of the requirement of skilled workers for the project which might not be available locally.

Table 6-11: List of project Land procured till date

S.No.	Location No.	Village Name	Land Owner	Sy. No.	Extent Acres. Cents (includes 2.99 acres for WTG and rest for access road)	SALE DEED No. & DATE
1.	PPD-40	Tatrakallu	Battala Pedda Venkata Swamy & 5 others	51-B	4.43	2974/2012, dt.02.11.2012
2.	PPD-06	Gadehothuru	Yella Nagaraju & 4 others	190	4.74	620/2014, dt.21.05.2014
3.	PPD-05	Gadehothuru	Attela Chidananda & 3 others	98G	5.01	706/2014, dt.03.06.2014
4.	PPD-01	Gadehothuru	Boya Thalari Kumara Swamy & 3 others	59-A	5.34	743/2014, dt.05.06.2014
5.	PPD-15	Pottipadu	Malapati Narayanaswamy & 7 others	11A1 & 11B	5.00	773/2014, dt.06.06.2014
6.	PPD-33	Vajrakarur	Namala Chandra Sekhar & 3 others	41A	5.25	789/2014, dt.10.06.2014
7.	PPD-27	Gulapalem	Daruru Srinivasulu & 2 others	370 & 373	3.08	821/2014, dt.12.06.2014
8.	PPD-12	Pottipadu	P.Somasekhar Reddy & 9 other	76	4.19	1000/2014, dt.05.07.2014
9.	PPD-32	Vajrakarur	Kaluvapalli Balarami Reddy & 4 other	43B	5.50	1014/2014, dt.14.07.2014
10.	PPD-16	Pottipadu	Haviligi Sunitha & 5 others, B.Venkata Ramudu & 5 other	25	5.00	1292/2014, dt.19.08.2014
11.	PPD-28	Gulapalem	Jambulapati Buggaiah Naidu & 1 other	365	4.00	1291/2014, dt.19.08.2014
12.	PPD-62	Vajrakarur	Palakaladinne Santhamma @ Lalithamma & 7 other	404	5.00	1295/2014, dt.19.08.2014
13.	PPD-44	Vajrakarur	Katta Manoj Kumar & 3 others	185	4.00	1329/2014, dt.22.08.2014
14.	PPD-14	Pottipadu	Malapati Umamaheswara Rao & 3 others	18/A	4.70	1527/2014, dt.29.09.2014

S.No.	Location No.	Village Name	Land Owner	Sy. No.	Extent Acres. Cents (includes 2.99 acres for WTG and rest for access road)	SALE DEED No. & DATE
15.	PPD-13	Pottipadu	Boya Yalugareddigaari Hanumanthu &11 others	82-2, 83-A	4.00	1604/2014, dt.20.10.2014
16.	PPD-58	Vajrakarur	Malaka @ Molaka Suryanarayana & 4 others	215	5.00	1919/2014, dt.18.12.2014
17.	PPD-85	Kamalapadu	Gadekallu Prathima @ Prathima Roopa	84B	4.50	1942/2014, dt.24.12.2014
18.	PPD-78	Kamalapadu	Gadekal Kesava Reddy & 1 other	263	3.48	1958/2014, dt.31.12.2014
19.	PPD-84	Kamalapadu	Mande Sreeramulu & 2 others	88B	5.00	1962/2014, dt.29.12.2014
20.	PPD-34	Vajrakarur	Singanamala Usmansab @ Usman & 11 others	49/B, 49/A	6.00	155/2015, dt.06.02.2015
21.	PPD-76	Kamalapadu	Golla Aadhinarayana Murthy &3 others	324/E	3.62	431/2015, dt.12.03.2015
22.	PPD-73	Vajrakarur	Jalla Sukanna & 14 others	521/B	4.46	734/2015, dt.24.04.2015
23.	PPD-74	Vajrakarur	Boggu Jayaramudu@Jayaramulu & 1 others	515/A	3.52	733/2015, dt.24.04.2015
24.	PPD-75	Kamalapadu	Golla Sreenivasulu & 3 others	370/F, 374,375/C3	4.50	818/2015, dt.01.05.2015
25.	PPD-77	Kamalapadu	N.Vani & 1 others	308,309	4.50	972/2015, dt.18.05.2015
26.	PPD-46	Vajrakarur	Goruva@Kurava@ Kalyala @M.Anjinamma & 6 others	97,92/B	5.50	949/2015, dt.01.05.2015
27.	PPD-45	Vajrakarur	Mallela Anantha Krishna & 5 others	121/A	4.73	999/2015, dt.21.05.2015
28.	PPD-35	Vajrakarur	Gadaputi @ Gadiputi Ramanjineyulu & 3 others	58	4.25	1330/2015, dt.24.06.2015
29.	PPD-11	Pottipadu	Pottipadu @ Boya Lalithamma & 7 others	61/B	4.00	1420/2015, dt.01.07.2015

S.No.	Location No.	Village Name	Land Owner	Sy. No.	Extent Acres. Cents (includes 2.99 acres for WTG and rest for access road)	SALE DEED No. & DATE
30.	PPD-47	Vajrakarur	M.Venkatalaxmi & 1 other	95	4.50	1669/2015, dt.25.07.2015
31.	PPD-57	Vajrakarur	M.Ramanaidu	117, 113, 111	7.00	1659/2015, dt.24.07.2015
32.	PPD-56	Vajrakarur	V.Hanumanna & 1 other	112	4.40	1700/2015, dt.27.07.2015
33.	PPD-55	Gulapalem	T.Satyasagar & 1 other	255, 254	4.25	1845/2015, dt.31.07.2015
34.	PPD-30	Vajrakarur	G.Rama Devi	15	4.25	1797/2015, dt.30.07.2015
35.	PPD-82	Gulapalem	G.Peddanna	175	4.00	1846/2015, dt.31.072015
36.	PPD-81	Gulapalem	B.LaxmiDevi & 1 other	162, 163, 164	3.98	1984/2015, dt.20.08.2015
37.	PPD-29	Vajrakarur	T.Rangnayakulu & 1 other	5 & 6	3.05	1931/2015, dt.12.08.2015
38.	PPD-02	Gadehothuru	G.Srinivasulu	53	4.00	P107/2015, dt.04.09.2015
39.	PPD-31	Pottipadu	G.Mastan & 3 others	115	4.39	registration WIP
40.	PPD-42	Vajrakarur	Under Negotiations	--	--	--
41.	PPD-43	Vajrakarur	Under Negotiations	--	--	--
42.	PPD-63,PPD-64,PPD-61, PPD-60, PPD-52, PPD-80,PPD-53, PPD-54, PPD-50		Under process of identification and finalization.	--	--	--

Source: MVIPL

6.5.2 *Land Contributors/owners*

The land team from Suzlon and the land aggregator had arranged meeting with 10 land owners on 27st August 2015, from the project villages. During the informal interview and discussions it was registered that the M/s. Chella representative had approached them individually and proposed interest in their land. The following concerns and expectations were raised:

- All the land owners expressed their desire to sell their land for the proposed project as most of the land comprises of fallow (rain-fed agricultural) land which does not generate any significant income since agriculture is dependent on rains;
- It was identified that the land owners have other land parcels (approximately 4 to 18 acres per family/household) ;
- During discussion with the land owners, all of them informed that the land compensation being offered is considered adequate by them;
- The land owners informed that three (3) out of 10 of the land owners would like to use the compensation money to invest it for social commitments such as marriages, two (2) would pay off their existing debts and betterment of their children and three (3) of them would utilize in suitable income generating purposes; and
- The compensation paid for land was also utilised for income generation, as two (2) of them plan to acquire agricultural land on more fertile area in other neighbouring villages where irrigation facilities are available.

Photo 6-5: Discussion with Land contributor/owners at Suzlon's Project office
Date: August 2015

Photo 6-6: Discussion with Land contributor/owners at Suzlon's Project Office
Date: August 2015

6.5.3 *Women Respondents*

Women are primarily responsible for domestic and household chores. Also, women are responsible for clearance and maintenance of their own agricultural fields and many of them work as agricultural labourers in others fields also. The concerns and expectations of the women is summarised as follows:

- Women expressed concerns about rainfall which they attribute to the development of wind power projects in the area;
- They expressed more of job opportunities such as security guards and drivers for local people in the wind power projects; and
- The women expressed their expectation on availability of good portable drinking water using RO system in their village.

Photo 6-7: Discussion with Women Land contributor/owners at Suzlon's Project office
Date: August 2015

Photo 6-8: Discussion with Women Land contributor/owners at Suzlon's Project office
Date: August 2015

Photo 6-9: Discussion with Shop owner and local resident of Vajrakarur Village
Date: August 2015

Photo 6-10: Discussion with women and local residents of Vajrakarur Village
Date: August 2015

6.5.4 Local Inhabitants/Villagers

Consultations in the form of questionnaire surveys was held at about seven randomly selected groups of local residents/influential persons such as school teachers and principal from the project villages. A copy of the social survey questionnaire has been attached as **Annexure I**. Although private land procurement for wind power projects is done on willing seller/willing buyer basis, community

consultation plays an important role to register the concerns and perception of the local community which directly or indirectly is going to be influenced due to the commencement of the project in the area.

Photo 6-11: Discussion with Primary School teachers at Pottipadu Village
Date: August 2015

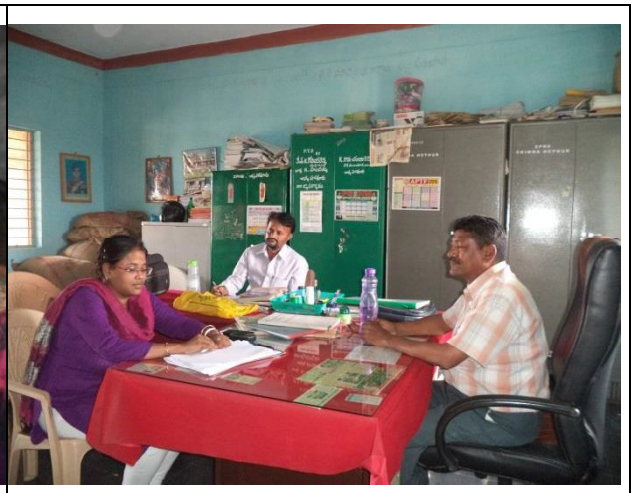


Photo 6-12: Discussion with School Principal and School Assistant at Chinna Hothur Village
Date: August 2015

6.4.5 Rural Development Trust (RDT) representative

RDT has been working in this area including the project area for more than 20 years. The region being a rain-shadow region with less rainfall and shortage of ground water, primary occupation of the area i.e agriculture is slowly deteriorating and people have taken up other skilled and non-skilled income generating occupation including construction and civil works. Local villagers tend to cultivate only during rainy season which is mostly groundnut, Tuar dal and cotton at few places. This monocrop pattern has declined the nutrient content of the soils in the area. In this aspect, RDT has been increasingly working and developing check walls to control soil erosion, building farm ponds for collecting rain water and providing counselling amongst the female population to educate themselves and their children.

Details of Consultation

Occupation and Livelihood - Agriculture is the key occupation in the project villages. However a significant population has shifted to other occupational pattern too. People from local community also work as agricultural labor in others farms. Generally rain-dependent cultivation is being carried out in the area. Farmers in the area cultivate their lands only in the rainy season and mostly grow Tur Dal and Groundnut in the fields. Other crops grown in the area include castor and sunflower etc.

Land Rate - Discussions were carried out regarding the impact of wind projects on the land value in the area. All the respondents conveyed that there has been a significant increase in the land rates due to the development of wind projects in the area. The land rates have reportedly increased by 3-4 times in the recent years.

Noise – The local community did not complain of noise due to wind turbine generators in general.

Shadow Flicker - During the perception survey, it was observed that the locals did not perceive the shadow flickering effect as an impact.

Traffic and Road conditions – Some of the locals complained that due to the heavy vehicular movement for development of earlier wind farms developed in the region, the conditions of the village road had deteriorated.

Rainfall - All the respondents especially women have expressed their concern on the change in the micro-climate of the area (i.e. decrease in Rainfall) which they attribute to the development of wind power projects in the area.

Grievances - During consultations with community members, it was observed that many villagers were not apprised of details such as who and how to contact the project management team in case of grievances. While different individuals had contact details of different project personnel, other villagers reported to having no information of contact persons. The land owners however are aware of the contact person from Suzlon to contact in case of any grievances.

Employment – Some of the locals responded that the earlier wind farm projects had resulted in employment generation during the construction works.

Expectations and Concerns regarding the proposed project

The community's perceptions about the proposed project were assessed through informal interviews. The locals did not express any concerns regarding shadow flicker phenomenon or increased noise generation. The locals expressed that the roads should be restored to its initial conditions in case of any damage due to movement of heavy vehicles.

The community and land owners also expects job opportunities to be created for the local population and community development through development of vocational training centers for women, provision of good portable drinking water (RO treated) in the villages and better health care infrastructure is also desired.

6.4.6 CSR and development needs

MVIPL has currently not finalised any Corporate Social Responsibility (CSR) activities to be implemented at the project villages. However Suzlon with many operational projects in the area has developed good community relationship. In view of this, as per the need assessment undertaken during the consultation process it is recommended that MVIPL shall plan their CSR activities as suggested below in coordination with Suzlon.

- Development of roads and their upkeep which will be utilised during installation and maintenance activities of WTGs, subsequently and benefit locals as well;
- Creation of alternate employment opportunities;
- Availability of portable drinking water utilizing RO plant in the project villages;
- Establishing of vocational training centres for women offering courses like stitching, knitting etc., which can be used as an income generating occupation for the local resident women.

6.4.7 Conclusion

From the stakeholder consultations conducted by AECOM, it can be concluded that the land contributors/owners are positive about the proposed wind power project. They are satisfied with the negotiation procedure followed for land procurement and the compensation being paid to them is above the prevailing market rates. Also, the land owners are willing to sell off their non-productive/fallow land at such prices.

However, it is imperative to mention that the local villagers and women folks are unconvinced about the growing wind power projects in the area which according to them is causing a decline in rainfall in the area. Therefore, it is expected that MVIPL in coordination with Suzlon shall address such misconceptions by setting up awareness camps and providing adequate information on the lack of any such impacts on the micro climate due to wind power projects. The women folks also expressed their expectation availability of good portable drinking water using RO system in their village which is very much needed for a drought prone area like Anantapur will scanty rainfall and depleting ground water levels.

6.6 Impact Assessment

6.5.1 Pre-construction Phase

In a wind power project, the pre-construction phase refers to assessment of various potential sites and then finalisation of the locations for the project. As soon as a location is finalised, it involves land clearance and site preparation before commencing the construction activities.

- *Impacts*
  - Land procurement; and
  - Site preparation.

Land Procurement

The total land required for the project cannot be ascertained at this stage since the land procurement for near about only 41 locations are completed and pending for rest of the 9 locations along with their access routes. However, based on the available information land procurement for the project will involve agricultural and fallow (rain-fed irrigated) lands only. Therefore, based on an area requirement of approximately 2.99 acre per WTG, the land requirement for the proposed project has been estimated as 149.5 acres of private land for WTGs only. The land is being procured on willing seller/ willing buyer basis and the price for the land is being determined based on negotiations and is reportedly three times higher than the prevailing market value of the land.

Land procured and identified for the proposed project will have limited adverse impact as it does not involve any physical displacement associated with the land for WTGs. The proposed project falls in drought prone area and also due to lack of irrigation facilities, agriculture is less preferred by the local community. The compensation paid for land will benefit the affected families economically, as they will be able to acquire agricultural land in more fertile area in other neighbouring villages where

irrigation facilities are available. Other use of compensation as reported during consultation were marriage of their daughters, pay off their existing debts and betterment of their children and utilization in suitable income generating purposes.

The impact on land procurement issues is expected to be of medium spread, short duration and low intensity with mitigation measures, the overall impact is assessed to be minor.

Site Preparation

Preparation of site or WTG location will primarily include clearing of ground vegetation, land levelling and compaction of unpaved roads. The project turbine locations consist of agricultural and fallow land (rain-fed agricultural land) with occasional agricultural activities during monsoons. Therefore, it is anticipated that this will not result in any significant loss of ground vegetation.

The impact due to land preparation is expected to be local spread, short duration and low intensity with mitigation measures. Hence, with appropriate mitigation measures as outlined the impact has been assessed to be insignificant.

- *Mitigation Measures*

Land procurement

During consultation it was noted that individual landowners were satisfied with the compensation paid. The following mitigation measures shall be taken into account and implemented by Suzlon and MVIPL to ensure:

- Details of associated facilities, i.e. transmission line and access road shall be discussed with the locals from project villages and the local community;
- It shall be ensured that the Land owners is provided with complete information about the project, including relevant details such as the lifespan of the project, its associated risks, impacts and benefits prior to sale agreements with them;
- All rates decided with land contributors shall be negotiated to suit both parties, and reflect a margin above the existing market rates. The land owners shall be provided an explanation on how the offered compensation has been calculated; and
- All sale/ lease deeds shall be in the local language (Telugu) and the land contributors shall not asked to provide on signatures on deeds in other languages such as English.

Site Preparation

The following measures shall be adopted in order to mitigate the impacts as discussed earlier:

- Re-vegetation shall be undertaken by MVIPL once the site preparation activities are over;
- It shall be ensured that native vegetation species shall be planted; and
- Since accessibility to humans and animals will increase post site preparation, it shall be ensured that excavated areas shall be guarded properly which can otherwise lead to accidents. Suzlon shall also demarcate certain areas for grazing in order to prohibit animals straying into turbine locations and transformer yards during project operation.

- Minimize presence of ancillary structures on the site by minimizing site infrastructure; including the number of roads, as well as by burying collector system power lines, avoiding stockpiling of excavated material or construction debris, and removing inoperative turbines.

➢ *Impact Value*

Aspect	Scenario	Spread	Duration	Intensity	Overall
Social/Livelihood Pattern	***Land Procurement***				
	Without Mitigation	Medium	Short	Moderate	**Moderate**
	With Mitigation	Medium	Short	Low	**Minor**
	Site Preparation				
	Without Mitigation	Local	Short	Moderate	**Minor**
	With Mitigation	Local	Short	Low	**Insignificant**

6.5.2 *Construction Phase*

Construction phase of a wind power project refers to multiple construction activities at the identified WTG locations. Construction activities include preparation of access roads and crane pad, developing the WTG foundation, working on the electrical connections, WTG assembly and installation. Impacts associated with the construction phase of the project are discussed below:

➢ *Impacts*

- Traffic Disturbance; and
- Labour Engagement

Traffic Disturbance

The following impacts have been identified that are likely to affect the neighbouring community and local villagers from nearby villages:

- Dust emissions and noise and vibrations from construction vehicle transit;
- Traffic congestion along the village/minor roads due to movement of heavy vehicles and other construction related vehicles;
- Short term closure of existing transport routes during proposed construction/widening of access roads thereby causing disruption and delays in traffic;
- Disturbance from traffic movement during night time;
- Potential for accidents to livestock and people;
- Damage to village roads and related structures;
- Parking of vehicles in open fields and other non-project locations;
- Movement of vehicle along transmission line through land not designated as ROW;
- Emissions due to idling of vehicles;
- Improper disposal of construction waste and debris from storage area;
- Increased probability of road accidents which may result in injury, fatalities or environmental damage; and
- Use of common property resources.

The construction of roads will be a short duration activity spread over 1-2 months and therefore the impact on community health and safety is assessed to be minor.

Labour Engagement

It's anticipated that during construction phase, the labour requirement will range from 50-60 during normal operations and 70-100 workers for peak construction activities. There will be an expectation for local recruitment and can cause rift and differences between the local community and the workers already engaged. Recruitment of staff lacking skill sets required for operation of construction machinery, use of construction tools etc. under pressure from community can lead to delay in project activities.

The labour for the construction works for the development of wind farm works will be hired locally and no significant influx of migrant population is envisaged. The project will not involve setting up of labour camps. Only skilled workers are required for crane operation and electrical works which will be brought in from outside, and will be limited to 8-10 persons. The workers coming from outside will be lodged in rented accommodation in nearby towns. The basic issues related with migrant labour may include:

- Conflict among workers based on cultural, religious or behavioural practices;
- Discontent amongst local community for engagement of outsiders;
- Spread of communicable diseases such as HIV/AIDS, tuberculosis, into the local community from infected migrant workers who have worked in different places; and
- Use of community facilities such as temples, transport facility etc. by migrant labour may lead to discontent with local community.

➢ *Mitigation Measures*

Traffic Disturbance

The following measures shall be adopted:

- Project transportation through community areas shall be avoided to the extent possible;
- The routes for transport of construction material for road development shall be finalised conducting a survey of the existing road conditions;
- The transportation of WTG components shall be avoided during peak traffic flow phases as identified during traffic volume survey;
- Routes shall be planned along wider and less-restrictive roads. Where road widths are insufficient, either temporary widening of the road with gravel or full depth widening of the pavement structure will be undertaken;
- Widening of shoulders and development of new roads will be discussed with the community and undertaken only after all concerns are addressed;
- All vehicles engaged for transportation shall be verified for fitness and valid Pollution Under Control (PUC) certificates issued by registered authorities;

- Any incidence of breakdown shall be attended immediately to ensure smooth flow of vehicle along the road. Movement of vehicle shall be restricted to the identified routes and only trained drivers shall be employed;
- High noise generating construction activities shall not be carried out during night time; and
- All public utilities like power transmission cables, telephone cables, water/sewerage lines, drains, tube wells etc. falling within road land width shall be inventoried, and arrange for relocation /shifting to adjacent areas in consultation with the respective agencies/authorities and community.
- MVIPL will ensure implementation of the ***Traffic Management Plan*** for minimising community disturbance due to WTG components and material transportation.

Labour Engagement

The following measures shall be adopted:

- Community expectations for employment and other local benefits need to be addressed and managed by the project proponent. Adequate representation for local labour shall be decided by the management of MVIPL and conveyed to the community. Regular updates on opportunities and skill requirements shall be provided to the community;
- Assess the exact number of workers to be required at each stage in the construction period and notify the community about number of labourers and skills required;
- The construction workers shall be instructed about their behaviour and interaction with the local community or other workers;
- To the extent possible sourcing of construction labour (masons etc.) shall be done from local region;
- Ensure local contracting and vendor opportunities as far as possible;
- Avoid using any community infrastructure facilities like water bodies, electricity etc.
- MVIPL shall ensure that the construction contractors engaged commit and adhere to social obligations including community relations, handling complaints and grievances, adherence to labour laws and international commitments etc.;
- The contractor shall provide adequate training on social behaviour and community interaction to the workers engaged by them;
- Health camps and awareness programs shall be conducted at regular intervals. Participation of local community members in such programs shall be ensured;
- The water usage shall be monitored and controlled to minimise the wastewater generation; and
- MVIPL shall ensure that no child labour, forced labour and non-discrimination, payment of wages, etc. are compiled to by the contractors;

➢ *Impact Value*

Aspect	Scenario	Spread	Duration	Intensity	Overall
Community/ Social Issue	***Traffic Disturbance***				
	Without Mitigation	Medium	Short	Moderate	**Moderate**
	With Mitigation	Local	Long	Low	**Minor**
	Labour Engagement				

	Without Mitigation	Medium	Short	Moderate	**Moderate**
	With Mitigation	Local	Short	Low	**Minor**

6.5.3 *Operation Phase*

Wind energy projects, large and small, are generally planned to function for 20-30 years. With proper maintenance and repairs, they often operate much longer. Impacts associated with the operation phase of the project are discussed below:

- *Impacts*

  - Alteration of Land use;
  - Visual Aesthetics;
  - Electromagnetic Effects;
  - Shadow Flickering Effects; and
  - Disruption in Tele-communication services

Alternation of Land Use

The project involves procurement of private rain-fed agricultural land, is being used for cultivation during rainy season only. Also, the project locations are surrounded by patches of agriculture and similar kind of rain-fed agricultural land. The main impact on land use is due to clearing of land for laying foundation for the WTG and also provision of internal roads. The selected project turbines viz., Suzlon make, S-97-2.1 MW will occupy around 2.99 acres of area per turbine.

Wind power projects can result in both temporary and permanent disturbance of land. The permanent disturbance is caused due to construction of wind turbine pads, access roads, substation and other infrastructure. Temporary disturbance is caused by temporary construction of access road, storage of equipment and laydown of storage facilities. Access roads have the highest footprint among all cases of permanent disturbance; they can account for 80% of the total land utilization, followed by turbine area (10%), substation (6%) and transmission lines (2-4%). In the case of temporary land disturbances, the staging area and temporary access roads can account for more than 90 per cent of the total land required.

Table 6-12: Land Disturbance due to Direct Impact

Permanent impact category	Area (%)	Temporary impact category	Area (%)
Turbine area	10	Staging area	30
Roads	79	Temporary roads	62
Substation	6	Sub/Trans Construction	6
Transmission	2	Other	3
Other	2		

Source: Paul Dendolm et al 2009, 'Land Use requirement of Modern Wind Power Plants in the United States'.

Although the change in land use is irreversible, the land foot print of the project is limited and does not allow any restriction on access to the internal access roads and area outside the fencing built around the WTG and its transformer yard.

Visual Aesthetics

Visual and aesthetic impacts are among the most commonly expressed concerns about the development of wind energy projects. Determination of what constitutes an adverse visual impact is highly subjective because it depends on the values, beliefs, and experiences of individual viewers.

Opinions about the aesthetic qualities of wind energy facilities can vary greatly among different segments of the population and from one location to another.

An adverse visual impact is defined as an unwelcome visual intrusion that diminishes the visual quality of an existing landscape. Changes that can be perceived as visual intrusions generally result from the introduction of visual contrast to the existing scene, based on differences in form, line, colour, and/or texture. Visual contrast with the existing landscape is often unavoidable because of the size and typical location of wind farms. Nevertheless, there are some measures that can be incorporated into the design of the project facilities to limit the degree of visual contrast and reduce the prospect that the contrast would be widely perceived as an adverse visual effect, or at least reduce the degree of the effect.

To avoid conflicts and problems with acceptance, visual aspects should play an important part in the planning and communication in the realization phase of wind parks. It is critical to recognize that wind turbines cannot be adjusted to meet visual criteria alone. The turbines must be located in the areas with appropriate wind resources in order for the project to be viable.

The layout for the wind turbines has been finalised based on a siting exercise which has accounted for visual impacts. All the wind turbines will have uniform visual characteristics such as colour, size, and design of turbine. All the project turbines are proposed on rain-fed agricultural land and are far away from the settlements. Also as per discussion with local village inhabitants, visual intrusion is not perceived as a significant impact.

As per Environment Health and Safety Guidelines on Wind Energy, prescribed by World Bank (August, 2015), consideration is to be given to the proximity of turbines to settlements, residential areas, and other visual receptors to minimize visual impacts and impacts on residential amenity, where possible. All relevant viewing angles should be considered when considering turbine locations, including viewpoints from nearby settlements.

Electromagnetic Fields (EMF) Effects

Wind turbines can cause electromagnetic interference in two ways:

- Physical Interference: where the blades of the turbine cut across an electromagnetic signal. This may affect microwave links, television signals, mobile telephones and airport radar systems; and
- Electrical Interference: caused by the operation of the generator. This may affect communication equipment in close proximity to the turbine.

No radio links have been identified within the vicinity of the project area which may be affected by due to operation of the project.

Blade Throw

Blade throw is a potential safety hazard which involves dropping of a rotor blade or the blade being thrown from the nacelle of the wind turbine in a high wind zone. The occurrence of blade throw can be due to two types of infrastructure failure:

- The whole blade detaching from the rotor and falling away from the turbine; or
- Part of the blade breaking off and falling away from the turbine;

Occurrences of these two scenarios could be caused by the factors such as:

- Design or manufacturing defect;
- Poor maintenance regime;
- Excessive winds during a storm (the region usually experiences frequent mild dust storms);
- Exceeding maximum design loads;
- Rotor over-speed; or
- Lightning or fire.

The overall risk of blade throw is considered to be low as occurrence of dust storms in the project area is occasional.

Shadow Flickering

Shadow flicker occurs when the shadow cast by the moving blades of a wind turbine passes through a window or a door. The effect of the shadow moving around with the blade makes it seem as if a shadow is flickering with each blade passing by (most large wind turbines have three blades, so three times per rotation) - comparable to someone turning on and off the light in rapid succession.

There is anecdotal evidence inter nationally that shadow flicker could lead to stress and headaches. There is also a fear that shadow flicker, especially in the range of 2.5-50 Hertz (2.5-50 cycles per second) could lead to seizures in epileptics and may also scare away livestock.

Shadow flicker is most pronounced at sunrise and sunset when shadows are the longest, and at high wind speeds (faster rotating blades leading to faster flicker). There are no uniform standards defining what distance from the turbine is regarded as an acceptable limit beyond which the shadow flicker is considered to be insignificant. There are also no uniform standards in India for the number of hours of flicker that are deemed to be acceptable. However, IFC on Environmental, Health and Safety Guidelines for Wind Energy recommends that that predicted duration of shadow flicker effects experienced at a sensitive receptor not exceed ***30 hours per year and 30 minutes per day*** on the worst affected day, based on a worst-case scenario.

All the identified project turbine locations are in general away from the main villages with human settlements. However, few locations were identified to be located close to temporary household or crop storage area, temple and a school. These can be considered as receptors of shadow flickering from project turbines. The details of the shadow receptor are provided in the Table below:

Table 6-13: Details of Shadow Receptor Locations

Software Label	Type of Receptor	Geographical Coordinates	Shadow causing WTG	Distance and Direction from WTG
PS1	A Household in the Fields	15° 2'31.86"N, 77° 21'55.18"N	PPD 45	382 m, NW
PS2	A Household in the Fields	15° 2'19.30"N, 77° 20'27.20"N	PPD 13 PPD 14 PPD 16	55 m , SSW 1446 m, SE 1934 m, E
PS3	A Small Temple	15° 1'36.77"N, 77° 21'07.20"N	--	--
PS4	Sai Temple	15° 1'22.67"N, 77° 22'51.88"N	PPD 62	1545 m, E
PS5	A School	15° 0'23.10"N, 77° 17'47.00"N	--	--

Source: Site Survey

Shadow flicker modelling was performed using EMD's WindPRO Software version 2.7, a wind modelling software program. WindPRO is used to calculate detailed shadow flicker map across an area of interest with site-specific locations using shadow receptors.

Shadow maps, which indicate where shadows will be cast and for how long, can be calculated at varying resolutions. Normal resolution was used for this study; it represents shadow flicker calculations that determine the sun angle every 5 minutes, every 7th day, over the period of an entire year, over a grid resolution of 20 meters by 20 meters.

Shadow flicker at each shadow receptor location is calculated every minute of every day throughout the entire year. Shadow receptors can be configured to represent an omni-directional window of a specific size (greenhouse mode) or a window facing a single direction of a specific size (single direction mode). The shadow receptors used in this analysis were configured as single direction-mode receptors representing a 1.5 meter wide by 1.5 meter high window.

The inputs for the WindPRO shadow flicker model include the following:

- The geographic locations and characteristics of the proposed WTGs;
- The locations of identified shadow receptors; and
- Turbine Model Specifications; and
- Topography was assumed to be flat as a *theoretical worst case* scenario.

The WindPRO software calculates the position of the sun throughout the day in accordance to the curvature of the earth, the time of year and the project site's position. The software calculates the occurrences of shadow flicker at each of the identified receptor. Analysis was conducted to represent a *theoretical worst case* scenario, with the following conditions:

- The sun is shining all day, from sunrise to sunset with clear skies;
- Rotor is perpendicular to the incident direction of the sunlight;
- Distances between the rotor plane and the tower axis are negligible;
- There are no obstructing features such as trees and vegetation;
- Light refraction in the atmosphere is not considered; and
- The wind turbines are always operating i.e. there is continuous wind of sufficient speed and no maintenance or down time.

The result of the modelling exercise is described below:

Table 6-14: Results of Shadow Flicker Modelling

Software Label	Shadow hours per year	Shadow days per year	Max shadow hours per day
	hr/yr	days/yr	hr/day
SN1	20:24	40	0:38
SN2	55:36	102	0:54
SN3	0:00	0	0:00
SN4	2:26	22	0:09
SN5	0:00	0	0:00

IFC guidelines on Wind Energy (August, 2015) have suggested ***30 hours of shadow flicker per year*** and ***30 minutes of shadow flicker per day*** as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance.

Accordingly, the above threshold parameters were used in this analysis to evaluate potential shadow flicker impacts on the receptors. As seen in the Table above, the flicker threshold limits exceeds at receptor location SN2 – a household in the field. From the detailed shadow modelling results, it can be inferred that PPD 13, PPD 14 and PPD 16 are the shadow causing WTGs at this receptor location.

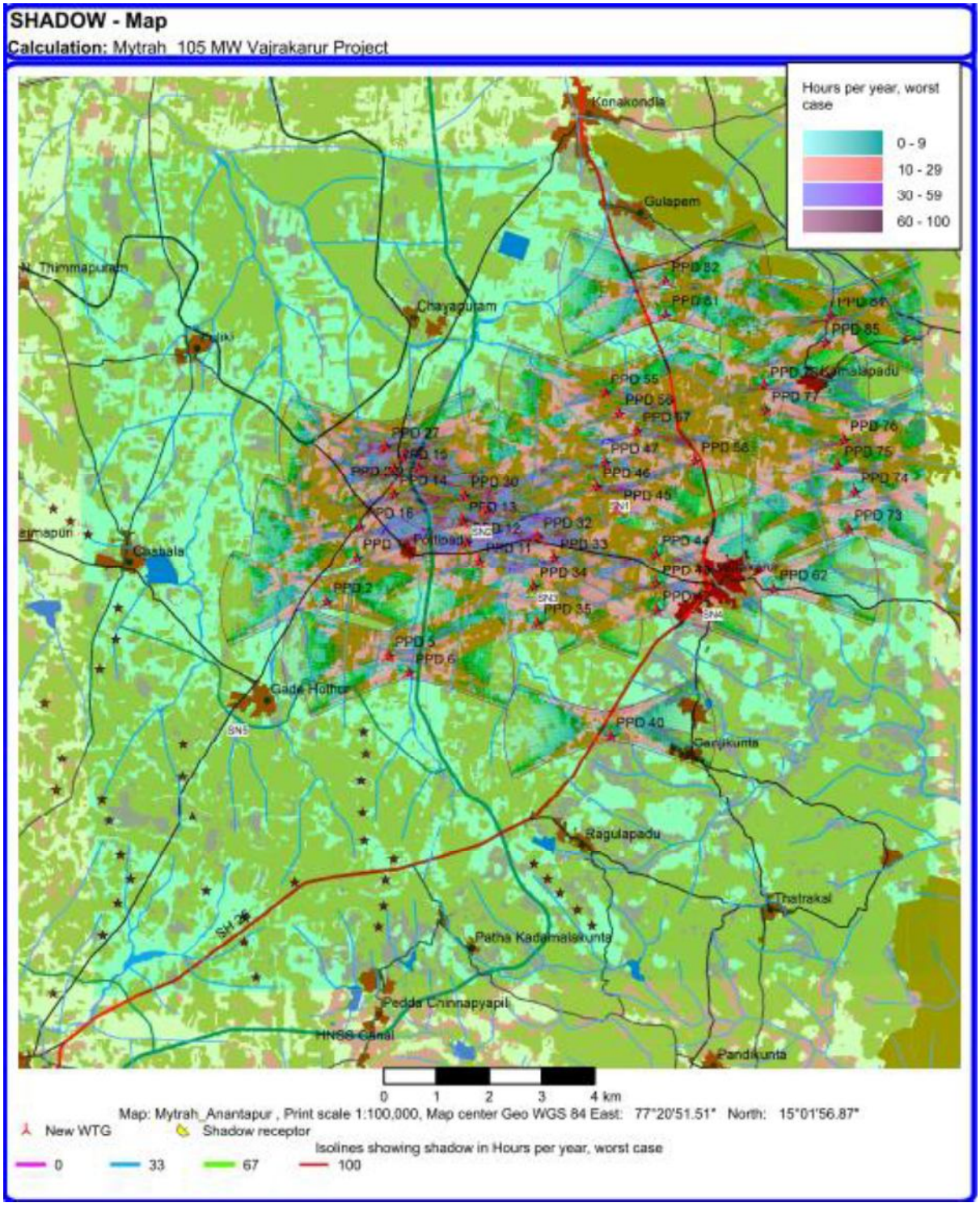
Table 6-15: Results of Shadow Flicker Modelling

Affected Receptor Location	Shadow Causing WTG	Amount of flickering on the shadow receptors caused by the WTG
SN1	PPD 45	20:24
SN2	**PPD 13**	**53:24**
	PPD 14	01:34
	PPD 16	00:35
SN4	PPD 62	02:26

As seen from the Table above, it can be inferred that maximum amount of flickering is caused by PPD 13 at receptor location SN2 for approx. 53 hours/ year. It is to be noted that the receptor is located at of 55 m SSW of PPD 13.

The modelling exercise accounts for the placement of turbines, receptors and sun angle such that the time when the turbine is in between the sun and the receptor is included in the total minutes per day and hours per year that shadow flicker could occur. However, this is a conservative analysis that does not account for maintenance time, calm winds when the turbines will not operate, light permeable obstacles such as trees and other structures, or the cloud covered days of the year. Therefore, the estimated theoretical worst case scenario certainly overstates the actual frequency of shadow flicker that would be experienced at any given receptor location.

Figure 6-6: Shadow Map



Disruption in Tele-communication services

Like any other large structures, wind turbines have the potential to cause interference with telecommunication signals such as, television and radio broadcasts, mobile phone services and radio communication services which tend to occur in proximity to habitations and often utilise the same ridgelines that provide optimum locations for wind turbines.

In general, very high frequency (VHF, 30 MHz – 300 MHz) and ultra-high frequency (UHF, 300 MHz – 3 GHz) band radio signals and digital voice based technologies are essentially unaffected by wind turbines. This includes land mobile repeaters, radio, the audio component of analogue television and mobile phones.

For broadcast signals which are usually omni-directional (or point to area), interference can generally be avoided by locating wind turbines distant from the broadcast tower or transmitter antenna. A clearance distance of at least 100 m to > 200 m is recommended for frequencies ranging from 100 MHz to > 1000 MHz[8]

No broadcast or mobile communications towers were identified within 500 m of the proposed project WTGs. Also, during the social consultations, it was confirmed by the local villagers that they do not experience any issues with mobile or television signals within the social study area. Therefore the development of the proposed wind project is not expected to have any widespread adverse impact on the telecommunication services.

- *Mitigation Measures*

Alternation of Land Use

- The entire land use in the project area shall not be altered since only a small area is occupied by WTGs;
- It is recommended that the project site should be set-up near the existing approach roads so that land footprint for access road construction is minimised;
- MVIPL to apply and obtain change of land use from Agricultural land and Non-Agricultural (NA) for industrial purpose; and
- The layout for access roads and transmission lines shall be developed considering the minimum land requirement as needed.

Visual Aesthetics

- The vane tips of the wind turbine shall be painted with Orange colour strips to avoid bird hits;
- Maintaining uniform size and design of turbines by having same direction of rotation, type of turbine and height on a wind farm or adjoining wind farm;
- Layout or adjustment should be such that turbine blades rotate in the same direction;
- Ensuring absence of any auxiliary structures except the required ones such as access roads and transformer yards which accompany the turbines; and

[8] C. Salema and C. Fernandes, "Co-Siting Criteria for Wind Turbine Generators and Transmitter Antennas, "Proceedings of Conf. de Telecomunicacoes, Sesimbra, Portugal, pp. 466-470, 1999