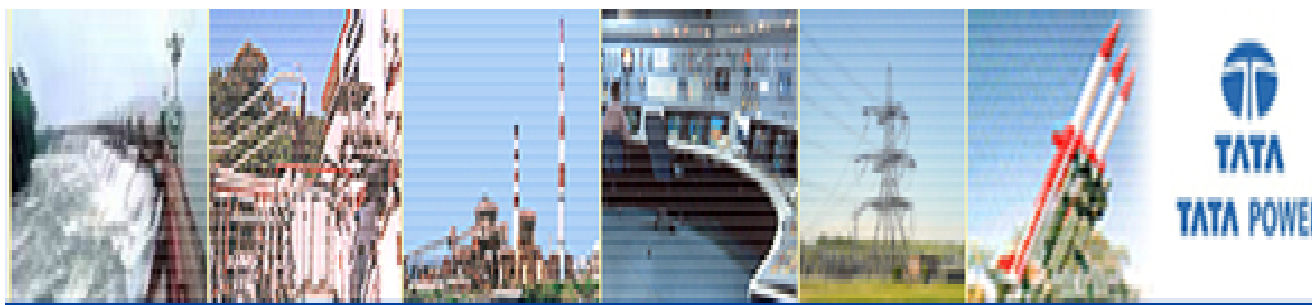
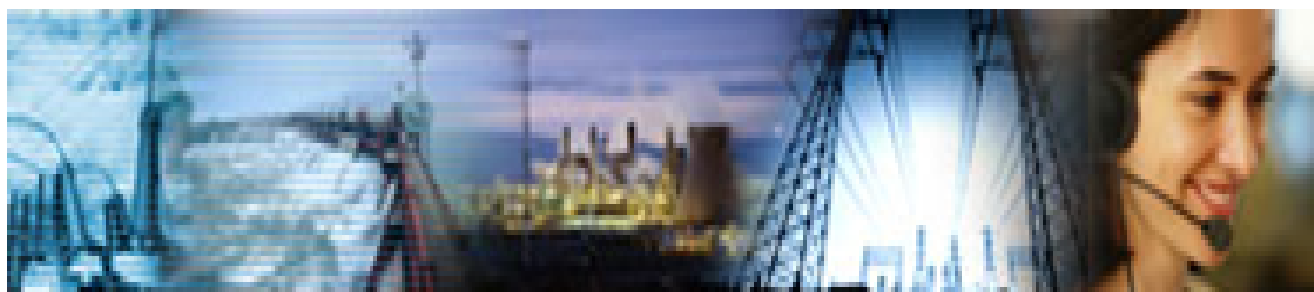


# **REPLY TO INTERNATIONAL FINANCE CORPORATION ON COMPREHENSIVE EIA COMMENTS**



**BY**  
**COSTAL GUJARAT POWER LIMITED (CGPL)**

Report prepared by Vishuddha Envirotech, Mumbai

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| PART I |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.     | <p><b>INTRODUCTION</b></p> <p>The proposed Ultra Mega Power Plant by Coastal Gujarat Power Limited (CGPL) a 100% subsidiary of Tata Power Company (TPC) will be located near Tundawand Village at Mundra Taluka, Kutch district of Gujarat Coastal area. The site is well connected with state Highway no. SH-50 (via Anjar) and SH-6 (via Gandhidham) and would be near to the proposed NH-8A (Delhi-Khandla). The latitude and longitude of the project site is 22° 49' 48" N and 69° 30' 58" E. The proposed 4,000 MW (Nominal) power plant would have a total 1242 Ha of land that includes 617Ha for main plant and 241 Ha of land for disposal of ash generated in 9 years. Approximately 182 Ha of land required for colony has been identified at a distance of 3 km from the power plant. Sufficient land is kept for green belt development and rainwater harvesting.</p> <p>The overall environmental impact of the UMPP is broadly divided into impacts during construction phase and operation phase. International Finance Corporation (IFC) has sought additional information on certain environmental impacts and their proposed mitigation measures.</p> <p>This report gives response to comments made by (IFC) on Comprehensive Environmental Impact Assessment (CEIA) report and also additional comments made by IFC during the week of October 22, 2007. The two sets of IFC comments are enclosed as set I and set II, respectively.</p> |



**PROJECT LOCATION**



**PROPOSED PROJECT**

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.  | <b>ENVIRONMENTAL IMPACTS &amp; MITIGATION MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|     | <p>A number of safeguards will be built-in during the design phase to minimize the impacts of the UMPP on the surrounding environment. The construction and operation phase environmental management plan has been aimed to achieve the following objectives:</p> <ul style="list-style-type: none"> <li>▪ To ensure that ADEQUATE environmental control systems are installed at the plant and that they are operating satisfactorily.</li> <li>▪ To ensure that quantity of pollutants discharged from the plant is within the stipulated limits.</li> <li>▪ To ensure that pollutants concentration in the surrounding area does not exceed the NAAQS norms.</li> <li>▪ To monitor impacts on the environment and the effectiveness of mitigation measures during the construction and operation phases.</li> </ul> |
| 2.1 | <b>GENERAL IMPACTS AND MITIGATION MEASURES FOR POWER PLANT CONSTRUCTION AND OPERATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|     | <p>Project environmental management is being and will continue to be undertaken by CGPL, in accordance with the management measures proposed in the CEIA. The main mitigation measures are summarized in Table 1 below.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Table1.

**GENERAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES  
FOR CGPL MUNDRA PROJECT DURING DESIGN AND CONSTRUCTION**

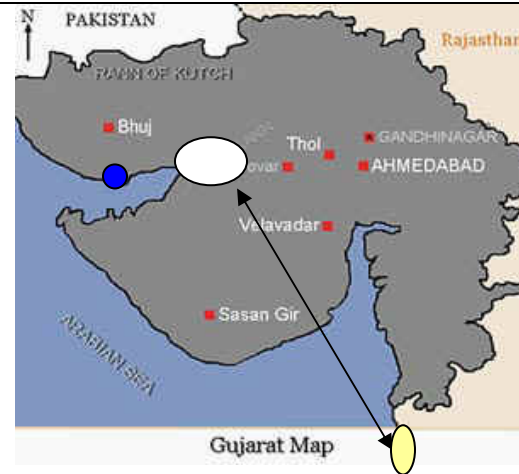
| PROJECT<br>ACTIVITY/ISSUE            | ENVIRONMENTAL<br>IMPACT/ISSUE | MITIGATION MEASURE                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Site<br>Preparation                  | Drainage                      | <ul style="list-style-type: none"> <li>▪ Preservation of the natural existing drainage as far as possible</li> </ul>                                                                                                                                                                                                                                                                              |
|                                      | Vegetation,                   | <ul style="list-style-type: none"> <li>▪ Minimization to damage to vegetation during site clearance.</li> </ul>                                                                                                                                                                                                                                                                                   |
| Construction<br>Pollution<br>Control | Water pollution               | <ul style="list-style-type: none"> <li>▪ Provision of washing and bathing facilities in the temporary construction township.</li> <li>▪ Treatment of waste water.</li> </ul>                                                                                                                                                                                                                      |
|                                      | Dust generation               | <ul style="list-style-type: none"> <li>▪ Regular watering of dust sources.</li> </ul>                                                                                                                                                                                                                                                                                                             |
| Construction<br>Noise                | Noise                         | <ul style="list-style-type: none"> <li>▪ Proper Personal protective equipment (PPE) will be provided to workers expose to high noise level.</li> </ul>                                                                                                                                                                                                                                            |
| Site<br>Rehabilitation               | Site<br>rehabilitation        | <ul style="list-style-type: none"> <li>▪ Topsoil saving during construction by reuse for site plantation.</li> <li>▪ Progressive site re-vegetation</li> </ul>                                                                                                                                                                                                                                    |
|                                      |                               |                                                                                                                                                                                                                                                                                                                                                                                                   |
| Pollution<br>Control                 | Air pollution                 | <ul style="list-style-type: none"> <li>▪ 275 m high emission stacks to promote wider atmospheric dispersion.</li> <li>▪ Provision of space for retrofitting flue gas desulfurization (FGD) units.</li> <li>▪ High efficiency electrostatic precipitators (ESP) to control SPM emissions.</li> <li>▪ Dust suppression system in the coal handling plant (CHP) area to minimize fugitive</li> </ul> |

|                |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |                       | <p>emissions:</p> <ul style="list-style-type: none"> <li>○ Water spraying to suppress dust during wagon unloading into the hopper, Dust suppression system will be provided at all transfer points. Coal stack yard sprayed with plain water.</li> <li>▪ Greenbelt development.</li> <li>▪ Water cover over deposited ash in ponds to avoid fugitive dust generation from wind.</li> </ul>                                                                                 |
|                | Water pollution       | <ul style="list-style-type: none"> <li>▪ pH adjustment of the dematerialized plant regeneration Drainage of the coal handling yard into a settling pond and oil handling areas into an oil separator waste in a neutralization pit.</li> <li>▪ Treatment of plant effluents at respective locations then fed into the central monitoring basin or dilution and buffering to meet discharge standards.</li> <li>▪ Treatment of sewage in sewage treatment plant.</li> </ul> |
|                | Noise                 | <ul style="list-style-type: none"> <li>▪ Equipment design to limit noise levels to 90 dB (A).</li> <li>▪ Acoustic enclosures to reduce noise emission.</li> <li>▪ Personal protective equipment for workers in high noise area</li> </ul>                                                                                                                                                                                                                                  |
| Ash Management | Ash management system | <ul style="list-style-type: none"> <li>▪ 100% extraction and storage of dry fly ash.</li> <li>▪ Storage of dry ash in silos and transportation by bulkers or enclosed trucks.</li> <li>▪ Pumping of bottom ash to disposal ponds.</li> </ul>                                                                                                                                                                                                                               |
|                | Ash utilization       | <ul style="list-style-type: none"> <li>▪ Seeking support from other organizations to utilize or mandate the use of fly ash (e.g. in clay brick manufacturing, cement manufacturing)</li> <li>▪ Promoting manufacturing of Fal- G bricks.</li> <li>▪ Use of fly ash bricks in plant and township construction to promote this material.</li> </ul>                                                                                                                          |
| Afforestation  |                       | <ul style="list-style-type: none"> <li>▪ Planting of greenbelts in plant area, township and community buildings.</li> </ul>                                                                                                                                                                                                                                                                                                                                                |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 3. | <b>Dredging of Channels</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|    | <p><b><u>IFC Comment (I-1):</u> If capital and maintenance dredging of the intake and out fall channels is proposed, information on disposal of dredged material may be provided. These details need not be included, if these have already been addressed in the Marine EIA. Further it may be useful to also clarify if any part of the channel will be lined ( particularly the on land stretch of the channels)</b></p> <p><b>Reply:</b> The quantity of material excavated in making the intake and outfall channel would be of the order of 4.1 Million M<sup>3</sup>. The quantity will be utilized for plant area leveling, road development, ash bund development and other construction uses. The details of maintenance dredging are given in the marine EIA (NIO, 2007). The channels will be lined online to the stretches.</p> |
| 4. | <b>Ash Pond Overflow &amp; Desal Reject</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|    | <p><b><u>IFC Comment (I-2):</u> It will be useful to mention the volume of the ash pond overflow water and desal reject water. If these volumes are likely to be significant, it may be useful to assess any impacts on the characteristics of cooling water at outfall, after ash pond overflow and desal plant rejects have been mixed with it.</b></p> <p><b>Reply:</b> There will not be any overflow from ash pond. The quantity of desal reject will be 210777 cum/day which is 1.9 % of the cooling water. Thus there will be a negligible effect on salinity of cooling water after the desal reject water is mixed with it.</p>                                                                                                                                                                                                     |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| 5. | <b>Coal Handling at Mundra Port</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|    | <p><b><u>IFC Comment (I-3):</u> While CEIA mention that the current facilities for handling coal at Mundra Port will be inadequate to handle the entire volume of coal proposed to be imported for the project, it will be useful to mention if and what additional facilities (berths and coal unloading, handling, storage and transportation facilities) are proposed to be set up to cater to the project.</b></p> <p><b>Reply:</b> CGPL has entered into an agreement with Adani Port which will expand its capacity to handle up to 13 Million Tons per Year. The additional coal handling facility will include a coal berth and unloading system with a Merry Go Round (MGR) rail car system. MGR is a train of hopper wagons which both loads and unloads its cargo while moving. In future, if possible, arrangement of conveyor belt will be made from the port to the plant site.</p> |
| 6. | <b>Mixing Height Data</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|    | <p><b><u>IFC Comment (I-4) :</u> It will be useful to include an explanation as to why the mixing height data of Ahmedabad would be adequate for use in this case</b></p> <p><b>Reply:</b> Indian Meteorological Department of western area is located in Ahmadabad which has authentic meteorological data. Also this is the nearest meteorological station from the site which has mixing height data. Hence data from this location is used.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| 7. | FLIGHT PATH OF MIGRATORY BIRDS- ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    | <p><b><u>IFC Comment (I-5):</u></b> It will be useful to also clarify whether the plant is in the flight path of any migratory birds, any of the flora and fauna listed are included in the schedule I-IV for Wildlife Protection Act; any scarred groves fall within the proposed plant area and any surface water bodies (water tanks/ponds) fall within the land area being acquired for the project.</p> <p><b><u>Reply:</u></b></p> <p><b>Migration of birds in Gujarat:</b> The Gulf area, which has many salt pans, islands and intertidal coastal system with mangroves offer favorable conditions for feeding, breeding and shelter to a variety of birds. All along the creek and in and around several islands tall mangroves trees are seen crowded with grey herons, pond herons, painted storks, small and large egrets. Given below are the locations where migratory birds are found more profoundly. According to the studies, it is found that the proposed project does not cause any hindrance in flight path of migratory birds since it is located at a considerable distance from the known nesting sites.</p> <p>Flamingos' travels from Little Raan run of Kutch in Gujarat to Sewri Bay in Mumbai They generally stay at Sewri Bay from November to May and then travel back to Raan of Kutch in June and stay till October. The project location is not in the way of the flying path of the birds.</p> |



- Migratory bird's sites
- Project site
- Little Run of Kutch
- Sewri Bay in Mumbai.
- Travel Path of Flamingo

**Location of the project:** The proposed power plant will be located near Tundawand village at Mundra taluka, Kutch district of Gujarat Coastal area. The latitude and longitude of the project site is  $22^{\circ} 49' 48''$  N and  $69^{\circ} 30' 58''$  E. It is located at about 80 km south from Bhuj. The surrounding study-areas mainly consisting of rural conglomerates with very sparse population. Agricultural fields are covered with herbs and shrubby vegetation Soil at project location is silty sand. Vegetation of the study area can be categorized as Northern tropical Forest sub type C-I Desert Thorn Forest. There is no national park, biosphere reserve, sanctuary, and habitat for migratory birds, archaeological site, or airports within 10 km radius of the project site.

Several studies show that the saltpans at Mundra are devoid of macrobenthos, which forms a major part of diet of migratory birds; therefore this site does not attract migratory birds. None of the flora and fauna listed in CEIA is from schedule I-IV for wild life protection act. Finally there is no surface water body or scarred grove within the land area being acquired for the project.

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                            |
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| 8.  | <b>BATCHING PLANT – ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                            |
|     | <p><b>IFC Comment (I- 6):</b> Elaborate clarification was requested by IFC on impact management measures pertaining to – Air Emissions from Batching plant and hot mix plant, hazardous material and hazardous waste handling, solid waste disposal, occupational health and safety provisions during construction.</p> <p><b>Reply:</b> The impact of batching plant would be on soil erosion during its erection, dust emission during its operation, water pollution due to runoff from the batching plant, noise &amp; dust due to vehicular movement, fugitive emission etc. Spillage of concrete while loading, spillage during loading and unloading operation, oil pollutions from vehicles. Mitigation measures are suggested for various activities which are given in details as follows.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> |                                                                                                                                                                                                                                                                                            |
|     | <b>ASPECT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>PROPOSED MITIGATION MEASURE</b>                                                                                                                                                                                                                                                         |
| 8.1 | <b>General Site Operations and Maintenance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>▪ The activities with the greatest potential to generate noise will be planned during periods of day which will result in least disturbance.</li> <li>▪ Stationary Batching equipments, stockpiles and plant vehicles will be located at</li> </ul> |

|     |                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |                                                                                                                | <p>least 25 feet from any property line.</p> <ul style="list-style-type: none"> <li>▪ Avoiding or minimizing transportation through community areas.</li> <li>▪ All equipments will be maintained according to manufacturer's recommendation.</li> <li>▪ Stockpiles will be maintained inside the buffer zone within the three wall bunkers which will extend at least two feet above the top of the unload line.</li> <li>▪ Routine maintenance of log book on-site of all equipment/filter system, recording date and time of all corrective actions.</li> <li>▪ Integrated quality, safety and environmental management systems for the site, operation of the plant and delivery process.</li> <li>▪ Soil erosion will be prevented by : <ul style="list-style-type: none"> <li>- Scheduling to avoid heavy rainfall periods (i.e., during the dry season) to the extent practical.</li> <li>- Re-vegetating areas promptly.</li> </ul> </li> </ul> |
| 8.2 | <p><b>Storage Silos</b></p>  | <ul style="list-style-type: none"> <li>▪ Identification of causes of all visible emissions and implementation of corrective action.</li> <li>▪ Air quality monitoring at storage silo conveying system for visible emissions and implementation of corrective action.</li> <li>▪ Enclosure will be provided to conveying system.</li> <li>▪ Provision of sufficient lighting near cement and/or fly ash silo exhaust to observe visible emissions performance during fills that occur during non-daylight hours.</li> <li>▪ Installation of audible and visual high- level alarms on all storage silos to avoid overfilling and possible filter damage.</li> </ul>                                                                                                                                                                                                                                                                                      |

|     |                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|     |                                                                                                     | <ul style="list-style-type: none"> <li>Installation of high level alarms indicators to an automatic delivery shut down to prevent overfilling.</li> <li>Checking of seating of pressure valves of all silos and reseating if necessary.</li> <li>All receiving hoppers and areas for unloading material will be enclosed on three sides.</li> </ul>                                                                                                                                                                                                                                        |
| 8.3 | <b>Material Handling/ Storage</b>                                                                   | <ul style="list-style-type: none"> <li>Storage of less than 5 millimeter storage aggregate will be done in totally enclosed structures (e.g. Storage bins).</li> <li>Ground stock piling will be done only if there is sufficient buffer area surrounding the plant is available.</li> <li>Plastic sheets will be provided to cover the stockpile entrance side.</li> <li>The opening between the storage bin and material weighing scale will be totally enclosed.</li> </ul>                                                                                                             |
| 8.4 | <b>Conveyors</b>  | <ul style="list-style-type: none"> <li>Enclosed belt conveyors will be used for eliminating the dust emission during handling materials.</li> <li>Scrapers will be provided at turning points to prevent dust collection on the belt.</li> <li>All the transfer points of the conveyors will be enclosed.</li> <li>All the free falling transfer points from conveyors to stockpiles will be enclosed and water sprays system will also be provided there.</li> <li>Arrangement of conveyors delivering to material stockpiles will be done in order to minimize the free fall.</li> </ul> |
| 8.5 | <b>Loading/Mixing Operations</b>                                                                    | <ul style="list-style-type: none"> <li>Loading of concrete trucks will be done in a systematic manner to minimize airborne dust emission.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|     |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |  | <ul style="list-style-type: none"> <li>Pre-mixing of materials will be done in a totally enclosed concrete mixer before loading the material into concrete trucks.</li> <li>Loading bay will be enclosed during the loading process. Dust traps will also be provided along with water sprinklers.</li> <li>The concrete vehicles will be kept clean preferably by dry cleaning methods before their exit from the property.</li> <li>Location of washing site will be selected accordingly after considering the site runoff characteristics.</li> </ul>                                       |
| 8.6 | <b>Housekeeping</b>                                                               | <ul style="list-style-type: none"> <li>The site will be swept regularly to remove dust built-up.</li> <li>Spillages if any will be cleaned immediately.</li> <li>Mostly dry clean up methods (sweeping, dust collection vacuum, wiping) will be implemented.</li> <li>There will be a restriction on dumping of material in open areas.</li> </ul>                                                                                                                                                                                                                                              |
| 8.7 | <b>Road and Yard Dust</b>                                                         | <ul style="list-style-type: none"> <li>Minimization of dust emission will be done by               <ul style="list-style-type: none"> <li>Proper site layout and design.</li> <li>Vehicle wheel clearing and vehicle wash facility at the exit.</li> <li>Control of vehicle speed limit.</li> </ul> </li> <li>Paving all regular paths of vehicle traffic with hard surface which can be cleaned by dry methods to minimize dust and run off to nearby properties and storm water.</li> <li>Use of dust preventive barriers / vegetative buffers along roads and work/traffic areas.</li> </ul> |

|      |                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| 8.8  | <b>Fugitive Dust</b>                                                                                  | <ul style="list-style-type: none"> <li>▪ Prevailing wind directions will be considered in set up of bunkers and conveyors to minimize wind effects.</li> <li>▪ Minimal water consuming sprays will be used for clean up.</li> <li>▪ All the aggregate material will be received in damp conditions.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                  |
| 8.9  | <b>Waste Concrete</b>                                                                                 | <ul style="list-style-type: none"> <li>▪ Waste concrete will be collected in suitable washout pit where it will become gravel, sand and finally sludge which will be reused.</li> <li>▪ Recycling system for residual concrete will produce filter cakes which can be used as limestone substitutes in construction of road, parking lots, bunkers etc.</li> <li>▪ Waste sediment sludge and fines will be used as fill material, gravel road stabilizer or landfill cover.</li> <li>▪ Commercially available delayed set admixtures designed to keep leftover truck concrete in liquid form will be used for optimum use.</li> </ul>                                                           |
| 8.10 | <b>Waste Water</b>  | <ul style="list-style-type: none"> <li>▪ Rainwater will be collected, stored and used for construction activity.</li> <li>▪ Waste water will be used for following purpose: <ul style="list-style-type: none"> <li>- Rinsing trucks exteriors.</li> <li>- Drum and chute washing and slumping.</li> <li>- Plant and ground wash downs and dust suppression.</li> </ul> </li> <li>▪ Berms or curbs will be made around truck loading areas, aggregate piles, truck washing stations and chemical staging areas to capture contaminated storm water and process water.</li> <li>▪ Site grading and porous paving will be used to improve storm water handling from general plant site.</li> </ul> |

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|  |  | <ul style="list-style-type: none"> <li>▪ Wastewater collection and recycling system will be designed for treatment of wastewater from: <ul style="list-style-type: none"> <li>- Agitator washout.</li> <li>- Truck washing.</li> <li>- Yard wash down.</li> <li>- Contaminated storm water.</li> <li>- Concrete batching area.</li> <li>- Slump stand.</li> <li>- Any other wastewater from the batching plant operation.</li> </ul> </li> <li>▪ Grit traps will be provided at the inlets of storm water drains.</li> <li>▪ Sediment traps will be installed within boundaries of the site.</li> <li>▪ Sediment/Grit traps will be regularly inspected.</li> </ul> |
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| 9.  | <b>HAZARDOUS WASTE HANDLING AND DISPOSAL – ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|     | <p><b>IFC Comment (I-6):</b> Exact details on quantities of hazardous materials usage and hazardous waste generation, their handling and disposal are to be furnished. Details of proposed spill control/ contamination prevention are also to be mentioned.</p> <p><b>Reply:</b> The amount of used oil (Category 5.1 as per Hazardous Waste Handling and Management Rules 1989 – till date) to be disposed is estimated to be about 40 TPA. Adverse Environmental Impacts (groundwater /surface water contamination) may be caused due to spillage during handling &amp; storage, accident to vehicle transporting HW. Accidental fire is also a hazard, albeit a rare one. Given below are the mitigation measures proposed for handling, storage and disposal of oil.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|     | <b>ASPECTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>PROPOSED MITIGATION MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 9.1 | <b>Used /Spent Oil Handling and Disposal</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>▪ Handling of HW will be done through trained persons.</li> <li>▪ Storage of HW will be done in isolated place with proper containment and away from sunlight, wind &amp; rain.</li> <li>▪ Spillage if any from the storage space will be collected in a second containment having adequate capacity.</li> <li>▪ Proper labeling of the HW.</li> <li>▪ HW for recycling will be given to MoEF authorized vendors.</li> <li>▪ Use of safety devices will be made compulsory.</li> <li>▪ Transportation of hazardous waste will be done through authorized transporter.</li> </ul> |

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|  |  | <ul style="list-style-type: none"><li>▪ Waste generated from waste treatment plant, water treatment plant, air pollution control devices will be evaluated to determine whether it contains hazardous components.</li><li>▪ Efforts will be made to prevent, reduce, recover and recycle as much as possible.</li></ul> |
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| 10.  | <b>OCCUPATIONAL HEALTH AND SAFETY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|      | <p><b><u>IFC Comment (I-7):</u> Particulars on Occupational Health and Safety during construction phase.</b></p> <p><b><u>Reply:</u></b> General Health and Safety provisions will be made available during the construction as well as operational phase.</p> <div>  </div> <div>  </div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|      | <b>ASPECT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>PROPOSED MITIGATION MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 10.1 | <b>Health &amp; Safety of Construction Workers</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Before the commencement of construction work, a person with control of a construction project will ensure existing services at the construction site are identified and the condition of and risk posed by these services are assessed.</li> <li>If pedestrian, traffic or plant movement at or near a construction site are affected by construction work, the person with control of the construction project will ensure that these movements are safely managed so as to eliminate or otherwise control any associated health and safety risks.</li> </ul> |

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|  |  | <ul style="list-style-type: none"> <li>▪ A person with control of a construction project will ensure that electrical installations, material, equipment and apparatus are designed, constructed, installed, protected, used, maintained and tested to eliminate the risk of electrical shock, burns, fire or explosion.</li> <li>▪ A person with control of a construction project will ensure that members of the public are not exposed to health and safety risks arising from the construction work.</li> <li>▪ Signs will be placed on each construction site, clearly visible from outside the site, stating the names and contact telephone numbers of the persons with control of the construction work, including an after-hours emergency telephone number.</li> <li>▪ The first aid provided on the construction site will take account of the number of persons working on the site at any one time that may be subject to injury in the event of an accident.</li> </ul> |
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| 11. | <b>COMMUNITY HEALTH AND SAFETY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|     | <p><b><u>IFC Comment (I-8):</u> Project Impacts on community health and safety with respect to landscape, drainage and hydrological changes, hygiene, influx of labor, movement of vehicles and transportation of materials.</b></p> <p><b><u>Reply:</u></b> The site is located near two villages Tunda and Wand in Mundra Taluka of Kutch District in the State of Gujarat at a distance of about 25 Kames from the Mundra town. The project area within 10 km. radius of the proposed Power Plant consists of 20 villages of which 10 are located in Mundra Taluka and 10 in Mandvi Taluka. The total population of the area within 10 Km radius of the site is 53,452 and total number of households in the study area is 10,161 as per Census 2001. Average family size in the area is 5.3. The percentage of males and females as per 2001 census is almost equal with 50.3% males and 49.7% females. Thus the sex ratio is 987 females per thousand males.</p> <p>The CGPL will ensure that there is minimal impact on community environment, health and safety, during both construction and operation. The company has, as part of the environmental assessment, identified likely community health and safety impacts and will implement mitigation measures for the identified impacts. Infrastructure and equipment will meet good industry practice requirements at the proposed plants. The company will, as part of the Environmental Health &amp; Safety Management System (EHSMS), put in place procedures to mitigate risk of uncontrolled release of hazardous materials, including risk to communities from hazardous material transport. Further, the company will, within a timeframe to be agreed with IFC, prepare and implement an onsite and offsite Disaster and Emergency Management Plan, and links it to the district emergency response plan. The project is not expected to exacerbate community exposure to disease either due to changes in land/hydrologic or other terrestrial/air quality/hydrologic regimes or due to influx of large pool of migrant laborers.</p> |

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| 11.1 | <b>Landscape, Drainage and Hydrological Changes</b>                                                                                                                   | <ul style="list-style-type: none"> <li>▪ Suitable drainage system with traps for arresting the sediment load of waste water for its proposed disposal into the main natural drainage system around the site.</li> <li>▪ Water pollution potential of the project will be mitigated by providing a Sewage Treatment Plant (STP) within the premises.</li> <li>▪ Existing trees and plants will be protected from damage during the works.</li> </ul> |
| 11.2 | <b>Hygiene and Influx of Labor</b>                                                                                                                                    | <ul style="list-style-type: none"> <li>▪ Where an influx of laborers is expected during the project construction period, the company will ensure that appropriate amenities/facilities for labor are provided by the EPC contractor during construction.</li> </ul>                                                                                                                                                                                 |

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|  |  | <ul style="list-style-type: none"> <li>▪ Migrant laborers along with their family members will be vaccinated against infectious diseases.</li> <li>▪ To the extent possible, members of local community will be employed as construction laborers.</li> <li>▪ Sexually transmitted diseases will be managed by the dissemination of information on preventive measures and by making rapid treatment easily available.</li> <li>▪ It is proposed that Project hospital facilities will be extended to population in the nearby villages and to the labors during construction period.</li> <li>▪ Project hospital will conduct time to time health checkups for the locals. First-aid facilities at various locations and temporary camps near the project works during construction will be provided.</li> <li>▪ Along with the programme on mass immunization, anti-malaria, child development and family welfare measures will be taken up in association with the State and Central government agencies for the villagers and labors.</li> <li>▪ Regular health check-up and programme for checking endemic disease will be done.</li> </ul> |
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| 11.3 | <b>Movement of Vehicles and Transportation of Materials</b> | <ul style="list-style-type: none"> <li>▪ Develop a materials movement plan to ensure that vehicle movement during construction has minimal impact on normal life patterns of nearby communities.</li> <li>▪ Maintenance of green belt in and around the project area.</li> </ul>                                                                                                                                                                                                                    |
| 11.4 | <b>General</b>                                              | <ul style="list-style-type: none"> <li>▪ Piped water supply for drinking purpose</li> <li>▪ Primary school with playground in each resettlement village</li> <li>▪ Approach roads and link roads to the main road</li> <li>▪ Primary health centers (PHCs) with free medical, immunization, and family planning facilities</li> <li>▪ Post offices with telephone facilities</li> <li>▪ Fire protection and safety measures will be provided to take care of fire and explosion hazards.</li> </ul> |

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| 12.  | <b>CONSTRUCTION OF RESIDENTIAL COLONY- ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                         |
|      | <p><b>IFC Comment (I-9): Details regarding employee colony and impact caused thus along with mitigation measures are to be furnished.</b></p> <p><b>Reply:</b> The residential colony for the employees will be constructed close to the plant on an area of about 182 Ha. This activity will have an impact on air, water and land environment along with addition of noise and dust emissions in that area.</p> <p>The mitigation measures for the same are given below:</p> <div style="display: flex; justify-content: space-around; align-items: center;">    </div> |                                                                                                                                                                                                                                         |
|      | <b>ASPECT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>PROPOSED MITIGATION MEASURES</b>                                                                                                                                                                                                     |
| 12.1 | <b>Generation of Sewage</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>▪ Construction of septic tank and sewage treatment Plant.</li> <li>▪ Reuse of treated waste for flushing and gardening</li> <li>▪ Awareness will be created for optimum use of water.</li> </ul> |
| 12.1 | <b>Generation of Solid Waste</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>▪ Segregation of solid waste at source.</li> <li>▪ Reuse and recycling of Paper, plastic &amp; metal waste.</li> <li>▪ Installation of biogas plant if technically feasible.</li> </ul>          |

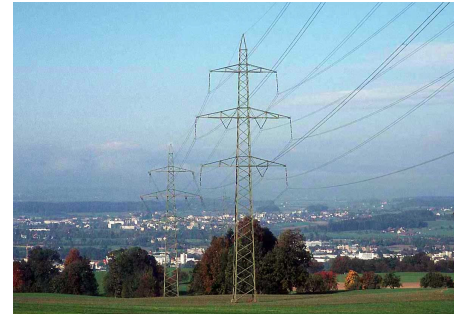
## COASTAL GUJARAT POWER LIMITED

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|      |  <p><b>Solid Waste Management</b></p> | <ul style="list-style-type: none"> <li>Composting of organic waste and use as manure.</li> <li>Disposal of inorganic solid waste at approved dumping ground.</li> <li>For temporary dumping site, leachate collection system will be provided.</li> <li>Door to door collection of solid waste.</li> <li>Training to families of employees to minimize the solid waste at source.</li> <li>Awards for maintaining clean roads and surrounding.</li> </ul> |
| 12.3 | <b>Vehicle Movement</b>                                                                                                | <ul style="list-style-type: none"> <li>Controlled vehicle movement.</li> <li>Use of company bus for mass transport &amp; minimum use of personal vehicles.</li> <li>Paving of colony roads to avoid dust pollution.</li> <li>Speed limit on vehicles on colony roads.</li> <li>Restriction on unnecessary blowing of horns</li> <li>Compulsion on PUC certificate.</li> <li>Ban on use of vehicle more than 15 years old.</li> </ul>                      |
| 12.4 | <b>Fuel of Cooking</b>                                                                                                 | <ul style="list-style-type: none"> <li>Arrangement of fuel like LPG/Kerosene/Cooking coal to the workers.</li> <li>Option of biogas plant will be considered.</li> <li>Community kitchen facilities would also be provided to the laborers by the contractors</li> <li>Scientifically designed improved chulhas for better fuel utilization</li> </ul>                                                                                                    |

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| 12.5 | <b>Additional Measures</b> | <ul style="list-style-type: none"> <li>▪ Rain water harvesting in the colony to minimize use of fresh water.</li> <li>▪ Ban on use of plastic bags and provision of alternative material for storage.</li> <li>▪ Plantation in the colony.</li> <li>▪ Use of existing ground slope while construction of colony houses to minimize the soil erosion and to minimize the effect on natural drainage.</li> <li>▪ Development of parks and playing ground.</li> <li>▪ Ban / fine individual for throwing waste material on road.</li> <li>▪ Training to students and house wives for solid waste management.</li> <li>▪ Community toilet facility during construction stage.</li> <li>▪ Proper water supply, sanitation and drainage facility during construction stage.</li> <li>▪ Biodiversity conservation including management of mangrove plantations.</li> </ul> |
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| 13. | <b>SITE SELECTION CRITERIA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|     | <p><b><u>IFC Comment (I-10)</u></b> While brief description of site selection criteria has been provided, a discussion detailing an Alternative Analysis may be included.</p> <p><b><u>Reply:</u></b></p> <p><b><u>Location:</u></b> The proposed power plant will be located near Tundawand village at Mundra Taluka, Kutch District of Gujarat Coastal area. The latitude and longitude of the project site is 22° 49' 48" N and 69° 30' 58" E.</p> <p><b><u>Site Selection Criteria:</u></b></p> <p><b>1) Connectivity:</b> The site is well connected with state Highway no. SH-50 (via Anjar) and SH-6 (via Gandhidham) and would be near proposed NH-8A (Delhi-Kandla). The nearest railway station is Adipur and is 57 km from the site. The railway station is well connected to multi- terminal Mundra Port through broad gauge railway system owned by M/s. Adani Group. The nearest airport is Bhuj which is about 60 km from the site. The site is about 2.5 km from the sea (Gulf of Kutch).</p> <p><b>2) Physical Features:</b> The site is fairly graded with minimum undulation and would require nominal filling and grading of the plant area to about 5 m MSL. The availability of seawater near the site is an added advantage. The population around the site is sparse.</p> <p><b>3) General:</b> The site is remotely situated from major town or eco-sensitive spots including national park, wildlife sanctuary, biosphere reserve, defence installation, places of historical importance etc.</p> <p><b><u>Alternative site:</u></b> PFC has identified a potential site for development of proposed coastal power project of 4000 MW (Nominal) located at Mundra Taluka, Kutch District in Gujarat State. Alternative sites near Kandla port was rejected because of:</p> <ul style="list-style-type: none"> <li>a) Non-availability of the sufficient draft for handling 12 MT/annum of coal.</li> <li>b) Inadequate coal handling facility.</li> <li>c) Unsuitable land consists of salt pans owned by private owners.</li> </ul> |

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| 14. | <b>TRANSMISSION TOWER EXECUTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|     | <p><b>IFC Comment (I-11):</b> The transmission lines (T-Line) are to be constructed and maintained by Power Grid Corporation of India Limited (PGIL), Assessment of their impacts and mitigation measures may be included.</p> <p><b>Reply:</b> The construction work of transmission towers will have following impacts.</p> <ol style="list-style-type: none"> <li>1) Clearing &amp; control of vegetation, loss of fragmentation of habitats, in right of way (ROW) and access roads and around substation sites.</li> <li>2) Surface water quality could be diminished as a result of vehicular traffic and foundation excavation, scraping and grading, and material laydown at pull sites/laydown areas, scraping grading in the vicinity of tower locations; Scraping and grading for the construction of new access roads, and constructing substations.</li> <li>3) Surface and groundwater quality could potentially be impacted during construction by an accidental release from a vehicle or motorized piece of equipment (diesel, gasoline, lubrication oil, hydraulic fluid, antifreeze, transmission fluid, or lubricating grease), or from a release of materials during concrete preparation or pouring for the pole foundations</li> <li>4) Noise pollution due to use of construction equipments.</li> <li>5) Air pollution due to emission from construction equipment</li> <li>6) Permanent removal of woody vegetation and in some cases to the complete conversion of strips of forest ecosystem into bare land or land covered by completely different vegetation communities. Fragmentation, pesticide use, and invasive plant species within the right-of-way can also affect surrounding forest areas.</li> <li>7) Risk of electrocution to the public, by direct contact with high voltage equipment and lines and also by induced voltages, especially in the case of vehicles and farm machinery that transit beneath transmission lines. Humans and farm animals can also risk electrocution or nuisance shock when inadequate grounding at substations energizes metal objects, such as stock tanks, outside substation grounds. Other safety threats include the collapse of transmission towers during storms.</li> </ol> |



PGIL will be asked to follow IFC norms in construction of all transmission lines.

|      | ASPECT             | MITIGATION MEASURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 14.1 | <b>Access Road</b> | <ul style="list-style-type: none"> <li>▪ Use of existing roads for transport of material as far as possible.</li> <li>▪ Appropriate routing of transmission lines and siting of substations, as well as proper design considerations (height, spacing, right-of-way) for transmission towers, and substation noise control</li> <li>▪ Avoiding route through forest, water bodies.</li> <li>▪ Compaction of access road to minimize dust pollution.</li> <li>▪ Transplantation of trees coming in the way of access road.</li> <li>▪ Use of optimum space for construction of access road.</li> <li>▪ Standard erosion and dust control practices would be used during construction to protect biological and hydrological resources.</li> </ul> |

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| 14.2 | <b>Construction of Tower</b>                   | <ul style="list-style-type: none"> <li>▪ Erosion-minimizing efforts such as sediment fences, sensitive area access restrictions, vehicle mats in wet areas, and retention/settlement ponds would be installed before extensive clearing and grading begins.</li> <li>▪ In the event that excess water and liquid concrete escapes from pole foundations during pouring, it would be directed to bermed areas adjacent to the borings where the water would infiltrate or evaporate and the concrete would remain and begin to set. Once the excess concrete has been allowed to set up (but before it is dry), it would be removed and transported to an approved landfill for disposal.</li> </ul> |
| 14.3 | <b>Construction Equipments &amp; Vehicles.</b> | <ul style="list-style-type: none"> <li>▪ Regular maintenance of the equipment will be carried out as per the guidelines of the manufacturer.</li> <li>▪ Vegetation buffer zone will be created to hinder the noise dispersion.</li> <li>▪ Compulsion of Pollution under Control certificate for construction vehicles.</li> <li>▪ Use of high quality new equipments for construction.</li> <li>▪ Training to operators, drivers, cleaners to minimize pollution.</li> <li>▪ Regular cleaning of equipments and vehicles.</li> <li>▪ Proper storage of material and optimal use of vehicles and machinery.</li> <li>▪ Ban on use of vehicle more than 15 years old.</li> </ul>                      |

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| 14.4 | <b>Cutting of Trees, Vegetation</b>                           | <ul style="list-style-type: none"> <li>▪ The use of existing utility and transportation corridors for transmission facilities will be preferred over the construction of new corridors, as long as such use does not adversely affect the environment or the pre-existing infrastructure.</li> <li>▪ Wetlands, forests, and other sensitive habitats disturbed by construction would be re-landscaped and replanted with native vegetation, and otherwise restored as nearly as possible to their original condition</li> </ul>                                                                                                                                                                                    |
| 14.5 | <b>Risk of Electrocution to the Public &amp; Farm Animals</b> | <ul style="list-style-type: none"> <li>▪ Widening span lengths to reduce the number of towers in sensitive habitats, or avoiding placing towers in sensitive locations such as rivers</li> <li>▪ Limiting construction to dry seasons or periods when the ground is completely frozen in order to minimize the effects of construction equipment on wet soils.</li> <li>▪ An environmental training program would be established to communicate environmental concerns and appropriate work practices, including spill prevention and response measures, to all field personnel. A monitoring program would be implemented to ensure that the plans are followed throughout the period of construction.</li> </ul> |

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| 15. | <b>COAL HANDLING, TRANSPORTATION AND STORAGE- ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|     | <p><b><u>IFC Comment (I-12):</u></b> It is mentioned that coal handling and storage at Mundra port will be the responsibility of the company. Assessment and management of impacts due to coal handling and storage at Mundra port may be included.</p> <p><b><u>Reply:</u></b> The coal handling and storage system covers proposed facilities for transport of coal from the exporting country to power plant by sea cum rail route, unloading and conveying coal up to the bunkers of the steam generators (SGs) or to the stockyard. Coal received by rail through BOBR wagons would be unloaded at the track hopper to be installed by the power project developer.</p> <p>The coal unloaded in to the track hopper would be conveyed either to the power plant bunkers or to the power plant stock yard by the in plant coal crushing, stacking, reclaiming, conveying and bunker feeding system of required capacity to be installed by the power developer. For the proposed units, space provision has been made in the coal stockyard to store about 30 days requirement of coal for all the five 800 MW Units. As the coal would also be stocked in Mundra port by Adani group, it is proposed to provide storage for 30 days in the power plant area to take care of any adverse eventualities. The necessary stacking and reclaiming system of required capacity would be provided by the power plant developer. The management of the stockpiles meant for the power plant inside the Mundra port would be by the power plant developer.</p> <p>The likely impacts due to coal handling facility are given as follows.</p> <p><b>Land Environment-</b> Disturbance at site due to various site preparatory activities, increased soil erosion.</p> <p><b>Water Environment-</b> Degradation of water quality due to run off from storage facility, deterioration of water quality due to spillage of coal while unloading from barges.</p> |

**Air Environment-** Impact on air due to fugitive emission from stockpiles, dust emission due to wind effect, dust emission during unloading and transportation of coal.

**Noise Environment-** Noise generation during operation of various equipments during unloading, loading and transportation operation.

The mitigation measures are suggested during coal handling and storage are listed below



|      | ASPECTS               | PROPOSED MITIGATION MEASURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15.1 | <b>Coal Unloading</b> | <ul style="list-style-type: none"> <li>▪ Coal stock yard and jetty area will be cleaned immediately once a phase of coal handling operation is completed.</li> <li>▪ Keeping the coal handling facilities, such as conveyor systems, covered and shielded from wind.</li> <li>▪ Install and maintain dust control systems, such as vacuum systems, at points where coal is loaded and/or unloaded.</li> <li>▪ The coal handling system will be designed such that it is capable of</li> </ul> |

|      |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                       | <p>being stopped and re-started as required, with all conveyor systems fully loaded with coal.</p> <ul style="list-style-type: none"> <li>▪ The coal handling system shall be designed to prevent coal fines from entering the plant sump and drain system.</li> <li>▪ The coal handling system will be designed to include fire smothering to control fires in the silo, conveyor, and tipple to the extent that such features are included in the design.</li> </ul>                                                                                                                                                                                                              |
| 15.2 | <b>Coal Transport</b> | <ul style="list-style-type: none"> <li>▪ Sufficient water and along with suitable dust suppression will be used before transporting the coal to power plant.</li> <li>▪ Green belt will be developed along the route of the railway track and around coal stock yard to minimize the noise impact.</li> <li>▪ Transportation will be stopped during high wind blowing condition.</li> <li>▪ Washing of rail wagons before leaving the plant premises will be done.</li> <li>▪ During the rainy season and rough weather condition rail wagons will be covered with tarpaulin sheets.</li> <li>▪ Proper drainage system will be provided along the merry go round system.</li> </ul> |

|      |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15.3 | <b>Coal Storage</b> | <ul style="list-style-type: none"> <li>▪ Water spraying will be done to minimize the fugitive emission.</li> <li>▪ Sufficient drainage system will be provided in the coal storage area and all the drain will be connected to settling tank through common drainage channel.</li> <li>▪ After settling of suspended particles, clear water will be reutilized for dust suppression. Solid material will be returned to the stock pile.</li> <li>▪ The stackers can be operated from a distance with brooms to keep the stack pile surface to minimum. This will reduces the area contributing to dust entrainment.</li> <li>▪ Regular removal of accumulated dust on the road sides will be done.</li> <li>▪ Autogenous combustion of coal stock will be prevented by limiting the coal stock height to 6 meters.</li> <li>▪ Continuous compaction of coal stock to avoid the air passage</li> <li>▪ Cover all coal piles, whether for daily operations or for emergency storage, such that prevailing winds will not disturb a pile's surface and generate fugitive dust.</li> </ul> |
|------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16. | GROUND LEVEL CONCENTRATION OF POLLUTANTS LIKE SPM, SO <sub>2</sub> , NO <sub>x</sub> - ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|     | <p><b>IFC Comment (I-13):</b> GLC prediction of PM, SO<sub>2</sub> and NO<sub>x</sub> with emission load at IFC emission standards may be undertaken. IFC's emission standards have been specified in the Thermal Power Guidelines. The supplement work needs to also detail, how the Company proposes to meet IFC's emission norms.</p> <p><b>Reply:</b> Maximum &amp; operating emissions are given in Table 1 below. The Maximum Ground Level concentration (MAGLC) levels are shown in the map given in the annexure-1 and annexure-2.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|     | <b>STANDARDS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|     | <p><b>NAAQS by CPCB</b></p> <p>SO<sub>2</sub>=80 ug/M<sup>3</sup></p> <p>NO<sub>x</sub>=80 ug/M<sup>3</sup></p> <p>SPM=200 ug/M<sup>3</sup></p> <p><b>Stack emission Limit</b></p> <p>SPM = 100 mg/Nm<sup>3</sup> (Dry, 6% O<sub>2</sub>)</p> <p><b>IFC Standards</b></p> <p>SPM 50 mg/m<sup>3</sup> (Dry, 6% O<sub>2</sub>)</p> <p>SO<sub>2</sub> 2000 mg/Nm<sup>3</sup> (Dry, 6% O<sub>2</sub>)<br/>and 450 T/day for 4000 MW</p> <p>NO<sub>x</sub> 750 mg/Nm<sup>3</sup> (Dry, 6% O<sub>2</sub>)</p>                                        | <ul style="list-style-type: none"> <li>275 m tall stacks for better dispersion of flue gas.</li> <li>Installation of ESP with design to meet 50 mg/Nm<sup>3</sup> (Dry, 6% O<sub>2</sub>) SPM.</li> <li>Installation of low NO<sub>x</sub> burners, NO<sub>x</sub> concentration in stack gas will be &lt;750mg/Nm<sup>3</sup> (Dry, 6% O<sub>2</sub>).</li> <li>Provision of space for installation of FGD if required.</li> <li>Use of low sulphur coal ( 0.6 wt % as received)</li> <li>SO<sub>2</sub> concentration in stack gas will be &lt;2000 mg/Nm<sup>3</sup> (Dry, 6% O<sub>2</sub>).</li> <li>Installation of online monitoring equipments for SO<sub>2</sub>, NO<sub>x</sub>, SPM.</li> <li>Installation of monitoring stations in the range of 10 Km radius.</li> <li>Installation of dust extraction system.</li> <li>Installation of fixed ambient air quality monitoring stations.</li> </ul> |

# COASTAL GUJARAT POWER LIMITED

Table 1: Input Data for CEIA-MAX and OPERATING Studies for Ultra Mega Power Plant of Costal Gujarat Power Ltd. in Mundra, Gujarat

| Coal Data and Emissions                                                                                                                                                                                                                                                                                                                                                           | CEIA- MAX       | OPERATING       | Units                                        | Comments, See Notes 1 & 2            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|----------------------------------------------|--------------------------------------|
| i) Calorific Value of Coal                                                                                                                                                                                                                                                                                                                                                        | 5,350           | 5,350           | Kcal/Kg                                      |                                      |
| ii) Sulphur Content                                                                                                                                                                                                                                                                                                                                                               | 1               | 0.6             | %                                            | Coal S = 0.6% for CEIA-OP            |
| iii)Ash Content                                                                                                                                                                                                                                                                                                                                                                   | 15              | 15              | %                                            |                                      |
| iv) Coal Firing rate                                                                                                                                                                                                                                                                                                                                                              | 38,210          | 34,389          | TPD for Plant-4000 MW                        | PLF = 90% for CEIA-OP                |
| v) Coal Firing rate                                                                                                                                                                                                                                                                                                                                                               | 318.4           | 287             | TPH Per unit- 800MW                          |                                      |
| <b>Stack Parameters</b>                                                                                                                                                                                                                                                                                                                                                           |                 |                 |                                              |                                      |
| i) Stack Height                                                                                                                                                                                                                                                                                                                                                                   | 275             | 275             | m                                            |                                      |
| ii) Stack Numbers                                                                                                                                                                                                                                                                                                                                                                 | 2( 3 + 2 flues) | 2( 3 + 2 flues) | Number                                       |                                      |
| iii) Exit Temperature                                                                                                                                                                                                                                                                                                                                                             | 134.5           | 134.5           | °C                                           |                                      |
| iv) Volumetric Flow Rate/Stack                                                                                                                                                                                                                                                                                                                                                    | 1,150.6         | 1,036           | m <sup>3</sup> /s                            |                                      |
| <b>Heat Input</b>                                                                                                                                                                                                                                                                                                                                                                 |                 |                 |                                              |                                      |
| Heat Input                                                                                                                                                                                                                                                                                                                                                                        | 1.70E+09        | 1.53E+09        | Kcal/hr                                      | PLF = 90%                            |
| Heat Input                                                                                                                                                                                                                                                                                                                                                                        | 2.0             | 1.8             | GJ/s                                         | PLF = 90%                            |
| Normal Flue Gas Flow                                                                                                                                                                                                                                                                                                                                                              | 693.4           | 624.0           | Nm <sup>3</sup> /s (dry, 6% O <sub>2</sub> ) | PLF = 90% See Note 3                 |
| <b>Emission Rate Per Stack</b>                                                                                                                                                                                                                                                                                                                                                    |                 |                 |                                              |                                      |
| i) SO <sub>2</sub>                                                                                                                                                                                                                                                                                                                                                                | 1,768.9         | 907.4           | g/s                                          |                                      |
| ii) NO <sub>x</sub>                                                                                                                                                                                                                                                                                                                                                               | 476.8           | 429.1           | g/s                                          |                                      |
| iii) SPM                                                                                                                                                                                                                                                                                                                                                                          | 68.8            | 28.7            | g/s                                          | <b>IFC STANDARD</b>                  |
| i) SO <sub>2</sub>                                                                                                                                                                                                                                                                                                                                                                | 2,551.1         | 1,454.1         | mg/Nm <sup>3</sup>                           | 2,000 mg/Nm <sup>3</sup> and 450 tpd |
| ii) NO <sub>x</sub>                                                                                                                                                                                                                                                                                                                                                               | 687.6           | 687.6           | mg/Nm <sup>3</sup>                           | 750 mg/Nm <sup>3</sup>               |
| iii) SPM                                                                                                                                                                                                                                                                                                                                                                          | 99.2            | 45.9            | mg/Nm <sup>3</sup>                           | 50 mg/Nm <sup>3</sup>                |
| Note: 1) CEIA-MAX column gives in out data with Coal S = 1 wt%, Plant Load Factor (PLF) = 100% and assuming all S (100%) goes to SO <sub>2</sub> .<br>2) CEIA-OP column gives the corresponding values when Coal S = 0.6 wt%, PLF = 90% and 95% of S goes to SO <sub>2</sub> .<br>3) IFC Guidelines: 350 Nm <sup>3</sup> /GJ for coal fired power plant ( dry 6% O <sub>2</sub> ) |                 |                 |                                              |                                      |

A recent IFC guideline also recommends that the incremental increase in ground level concentration of any pollutant should be less than 25% of the ambient air quality norm. For SO<sub>2</sub>, the ambient air quality norm for Mundra is 80 microgm/m<sup>3</sup> (24 hr average) since it is a rural area. Thus, the maximum incremental increase in SO<sub>2</sub> level should be less than 20 microgm/m<sup>3</sup>. It shall be noted, however that the area may be identified as “Industrial Zone”. In that case the standard will be 120 mg/m<sup>3</sup>.

**Incremental SO<sub>2</sub> (See Annexure-1; Table:1g, 1a & 1d):**

The worst case incremental increase on ground level SO<sub>2</sub> concentration is estimated to be 33.7 µg/m<sup>3</sup> at 5.4 km SW of the plant; a point which is in the sea. Out of the 8 villages where the background levels were measured, the maximum incremental ground level SO<sub>2</sub> level will be 23.5 µg/m<sup>3</sup> for 24hrs average and 3.2 µg/m<sup>3</sup> for annual average.

**Incremental NO<sub>x</sub> (See Annexure-1; Table:1g, 1b & 1e):**

The worst case incremental increase on ground level NO<sub>x</sub> concentration is estimated to be 19.7 ug/m<sup>3</sup> at 5.4 km SW of the plant; a point which is in the sea. Out of the 8 villages where the background levels were measured, the maximum incremental ground level NO<sub>x</sub> level will be 13.8 µg/m<sup>3</sup> for 24 Hrs average and 1.9 µg/m<sup>3</sup> for annual average.

**Incremental SPM (See Annexure-1, Table 1g, 1c & 1f):**

The worst case incremental increase on ground level SPM concentration is estimated to be 2.9 ug/m<sup>3</sup> at 5.4 km SW of the plant; a point which is in the sea. Out of the 8 villages where the background levels were measured, the maximum incremental ground level SPM level will be 2.0 µg/m<sup>3</sup> for 24 Hrs average and 0.27 µg/m<sup>3</sup> for annual average.

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |                                                           |                     |               |                    |                           |                       |                           |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------|---------------------|---------------|--------------------|---------------------------|-----------------------|---------------------------|
| 17.                        | <b>ASH DISPOSAL – ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |                                                           |                     |               |                    |                           |                       |                           |
|                            | <p><b><u>IFC Comment (I-14): Risk Assessment of the ash pond may be undertaken.</u></b></p> <p><b><u>Reply:</u></b> The average annual generation of ash from 5 x 800 MW Coastal Gujarat Power Limited, Mundra will be as under:</p> <table border="0"> <tr> <td>Coal Consumption (85% PLF)</td><td>: 11-13 Million Tons/annum (average:12Million Tons/annum)</td></tr> <tr> <td>Ash content in coal</td><td>: maximum 15%</td></tr> <tr> <td>Fly Ash generation</td><td>: 1.44 Million Tons/annum</td></tr> <tr> <td>Bottom Ash generation</td><td>: 0.36 Million Tons/annum</td></tr> </table> <p>Risk associated with the ash pond is spillage of ash over road; air pollution is caused by wind-blown ash dust from ash mound/pond, contamination of surface water and ground water due to lechate from ash pond. The air-borne dust can pollute sea water, fall in surface water system or soil and may contaminate the water/soil system, The long storage of ash in ponds under wet condition and humid climate can cause leaching of toxic metals from ash and contaminate the underlying soil and ultimately the groundwater system.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> | Coal Consumption (85% PLF) | : 11-13 Million Tons/annum (average:12Million Tons/annum) | Ash content in coal | : maximum 15% | Fly Ash generation | : 1.44 Million Tons/annum | Bottom Ash generation | : 0.36 Million Tons/annum |
| Coal Consumption (85% PLF) | : 11-13 Million Tons/annum (average:12Million Tons/annum)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |                                                           |                     |               |                    |                           |                       |                           |
| Ash content in coal        | : maximum 15%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |                                                           |                     |               |                    |                           |                       |                           |
| Fly Ash generation         | : 1.44 Million Tons/annum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |                                                           |                     |               |                    |                           |                       |                           |
| Bottom Ash generation      | : 0.36 Million Tons/annum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |                                                           |                     |               |                    |                           |                       |                           |

|      | ASPECT                                                                                                                                                                                                                                                                                                                                 | PROPOSED MITIGATION MEASURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17.1 | <b>Air Pollution</b>                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>▪ Disposal of ash in concentrated slurry form through pipes.</li> <li>▪ Spraying of water/treated wastewater for dust suppression.</li> <li>▪ Plantation of trees around ash pond.</li> <li>▪ Location of ash pond away from the habitation.</li> <li>▪ Maintaining the wetness of the ash in ash pond with adequate water spraying.</li> <li>▪ The ash disposal system shall be designed, and constructed to minimize the possibility of dropping ash on to any unpaved area.</li> </ul> |
| 17.2 | <b>Water Pollution</b>                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>▪ Construction of ash pond with compacted and impervious bed.</li> <li>▪ Plantation of trees around ash pond.</li> <li>▪ Construction of lechate collection system</li> <li>▪ Continuous monitoring of surface and groundwater water systems around ash pond.</li> <li>▪ Best engineering practice will be adopted to eliminate ground water pollution.</li> </ul>                                                                                                                        |
|      | <p><b>IFC Comment:</b> Details about ash pond overflow water and diesel reject water.</p> <p><b>Reply:</b> There will not be any overflow from ash pond. The quantity of diesel reject per day will be 210777 cum which is 1.88 % of the cooling water. There will not be any effect of diesel reject on the outlet cooling water.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| 18.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | GREEN HOUSE GAS EMISSION REDUCTION |                                   |                |                                   |    |    |      |      |    |      |      |    |     |      |    |     |      |    |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|----------------|-----------------------------------|----|----|------|------|----|------|------|----|-----|------|----|-----|------|----|-----|
| <p><b>IFC Comment (I-15): GHG emission assessment may be undertaken including a description of the extent to which supercritical technology will result in lower GHG emissions as compared to prevalent sub critical technologies.</b></p> <p><b>Reply:</b> Thermal efficiency is a measure of how much useful energy can be extracted from a given amount of coal. Thermal efficiency in coal-fired power generation has increased from 35% in 1990 to an average of 38% for modern pulverized coal (PC) power plants. Every 1% increase in thermal efficiency results in a 2-3% decrease carbon dioxide emissions. Advanced modern plants use specially developed alloy steels which enable the use of supercritical steam to achieve efficiencies of 42% and above. Figure 1 shows that increase in efficiency results in reduction in CO2 emission. With conventional (PC) boiler, CO<sub>2</sub> emission is more than 1150 Kg/MWh where as with supercritical (SCPC) technology emission is less than 900 kg/KWh. The thermal efficiency and CO2 emission factors for Circulating Fluid Bed Combustion (CFBC), Pressurized Fluid Bed Combustion (PFBC) and Integrated Gasification Combined Cycle (IGCC) plants are also given.</p> <div><div><table><caption>% Efficiency &amp; CO<sub>2</sub> Emission From Different Combustion Technologies</caption><thead><tr><th>Technology</th><th>Efficiency (%)</th><th>CO<sub>2</sub> emission (Kg/MWh)</th></tr></thead><tbody><tr><td>PC</td><td>37</td><td>1150</td></tr><tr><td>CFBC</td><td>37</td><td>1040</td></tr><tr><td>SCPC</td><td>41</td><td>890</td></tr><tr><td>PFBC</td><td>42</td><td>875</td></tr><tr><td>IGCC</td><td>43</td><td>835</td></tr></tbody></table></div><div><p><b>PC-</b> Pulverized Combustion<br/><b>CFBC-</b> Circulating Fluidized Bed Combustion<br/><b>SCPC-</b> Super Critical Pulverized Combustion<br/><b>PFBC-</b> Pressurized Fluidized Bed Combustion<br/><b>IGCC-</b> Integrated Gasification Combined Cycle Combustion</p></div></div> <p><b>Efficiency &amp; CO<sub>2</sub> emissions from different combustion technologies</b></p> |                                    | Technology                        | Efficiency (%) | CO <sub>2</sub> emission (Kg/MWh) | PC | 37 | 1150 | CFBC | 37 | 1040 | SCPC | 41 | 890 | PFBC | 42 | 875 | IGCC | 43 | 835 |
| Technology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Efficiency (%)                     | CO <sub>2</sub> emission (Kg/MWh) |                |                                   |    |    |      |      |    |      |      |    |     |      |    |     |      |    |     |
| PC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 37                                 | 1150                              |                |                                   |    |    |      |      |    |      |      |    |     |      |    |     |      |    |     |
| CFBC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 37                                 | 1040                              |                |                                   |    |    |      |      |    |      |      |    |     |      |    |     |      |    |     |
| SCPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 41                                 | 890                               |                |                                   |    |    |      |      |    |      |      |    |     |      |    |     |      |    |     |
| PFBC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 42                                 | 875                               |                |                                   |    |    |      |      |    |      |      |    |     |      |    |     |      |    |     |
| IGCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 43                                 | 835                               |                |                                   |    |    |      |      |    |      |      |    |     |      |    |     |      |    |     |

Ernst and Young (E&Y) has completed the Project Description Document (PDD), which will be sent to IFC separately. The estimates for baseline CO<sub>2</sub> emissions, and CO<sub>2</sub> reductions, are given below (E&Y, 2007). E&Y has followed the International Panel on Climate Change (IPCC) Protocol in these calculations.

**Table: Estimated Baseline CO<sub>2</sub> Emissions and Reductions for UMPP Mundra (E&Y, 2007)**

| Case                    | EF, ton/MWh         | MWh/year <sup>a</sup> | CO <sub>2</sub> , Ton/year |
|-------------------------|---------------------|-----------------------|----------------------------|
| Baseline                | 1.0986              | 28,032,000            | 30,796,000                 |
| UMPP Mundra             | 1.0450 <sup>b</sup> | 28,032,000            | 29,293,400                 |
| CO <sub>2</sub> Savings | NA                  | 28,032,000            | 1,502,600                  |

a: Plant Load Factor = 80%. Five (5) boilers each producing 800 MW (gross)

b: Emission Factor (EF) for UMPP Mundra is derived from the CO<sub>2</sub> emissions estimated by Ernst and Young. It is also very close given in Fig. 1 for SCPC.

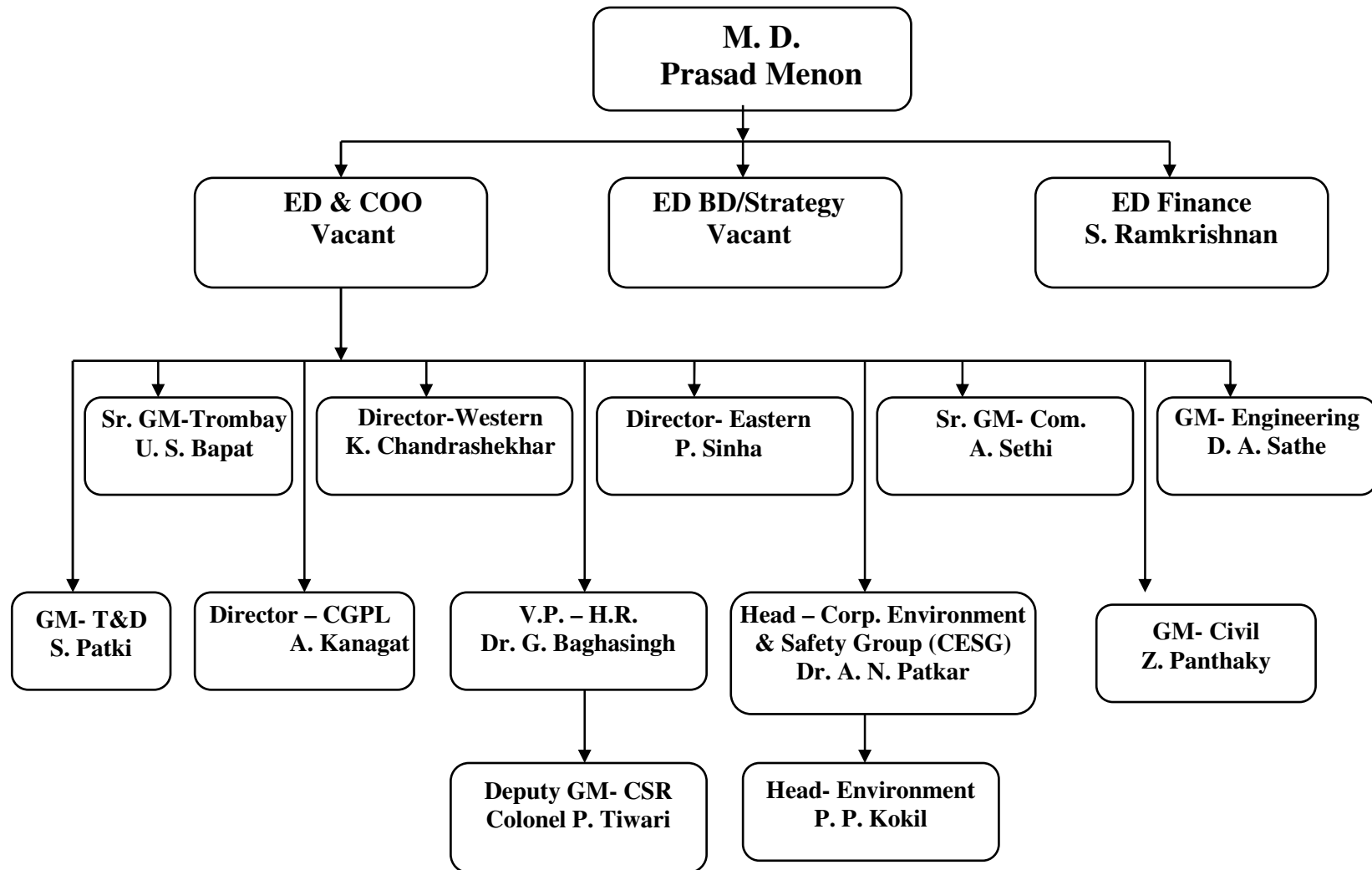
The actual CO<sub>2</sub> emission reductions could be higher if the EF for supercritical boiler is verified to be less than the one assumed above. TPC has made independent evaluations of the EF for the baseline case for the coal that will be used in the UMPP and also for the super-critical conditions. Central Electric Authority (CEA) of India has recently published the EF for CO<sub>2</sub> for all major operating plants in India. For Western Region, the average value is close to 1.0 ton CO<sub>2</sub> /MWh. And, using the coal carbon content and the expected heat rate for UMPP (2,130 Kcal/kWh), an EF of .85 ton CO<sub>2</sub>/MWH has been estimated for the UMPP. With these EF, the CO<sub>2</sub> emissions would be 28.03 Million tons/year (Baseline) and 23.83 Million tons/year (UMPP).

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|            |                                                                                                                                                                                                                                                                                                                                                                                 |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            | If FGD were used, the net electricity produced would be 1% less as compared to the design selected. Thus, additional coal would have had to be burnt compensate for the loss by the FGD system. This would have caused additional CO <sub>2</sub> emissions of 292,340 Tons/year (1% of those for proposed plant using E&Y estimate) or 238,300 Tons/year (using TPC estimate). |
| <b>19.</b> | <b>CWPRS study</b>                                                                                                                                                                                                                                                                                                                                                              |
|            | <b>IFC Comment (I-16: If the CWPRS study has been completed, it would be good if it could be made available</b><br><b>Reply:</b> CWPRS study is not yet done. It will be done shortly.                                                                                                                                                                                          |
| <b>20.</b> | <b>Marine EIA</b>                                                                                                                                                                                                                                                                                                                                                               |
|            | <b>IFC Comment (I-17): It would be good if a copy of the marine EIA could be made available for review.</b><br><b>Reply:</b> A hard copy of the EIA report has been submitted to IFC separately.                                                                                                                                                                                |

| PART II |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | <b>ORGANIZATION CHART</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|         | <p><b>IFC Comment ( II-1) : Organizational Chart /Budget/Resources of CGPL/TPC showing HSE/CSR</b></p> <p><b>Reply:</b> The organizational chart is given in the next page of this report. TPC has a Corporate Environment &amp; Safety Group (CESG) which looks after safety and environmental issues of TPC and also CGPL at this time. The Head of CESG, Dr.A.N.Patkar reports directly to The Managing Director (MD) of TPC. The Deputy General Manager (DGM) of Corporate Social Responsibility (CSR), Colonel P.Tewari, reports to Vice President (Human Resource) Mr. Baghasingh. The Budget for CESG is Rs. 4 Crores (\$ 1.1 Million) per year.</p> |
| 2.      | <b>INCREMENTAL AIR QUALITY IMPACTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|         | <p><b>IFC Comment (II-2): UMPP's incremental air quality impacts on annual average for SPM, RSPM10 SO<sub>2</sub>, NO<sub>x</sub>-output/summary.</b></p> <p><b>Reply:</b> The reply is covered in point number 17 of part I.</p>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 3.      | <b>INCREMENTAL AIR QUALITY IMPACTS USING REFINED ASSUMPTIONS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|         | <p><b>IFC Comment ( II-3) : UMPP's incremental air quality impacts using refined assumptions</b></p> <ul style="list-style-type: none"> <li>a) <b>Planned PLF</b></li> <li>b) <b>S emission factors</b></li> <li>c) <b>0.6 % sulfur content ( Instead of 1.0 % sulfur content)</b></li> </ul> <p><b>Reply:</b> The reply is covered in point number 17 of part I. The isocontour lines over surrounding villages and worst case scenario locations given in annexure-1.</p>                                                                                                                                                                                 |

## ORGANIZATION CHART: TPC



|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4. | <b>ALTERNATIVE ANALYSIS FOR COOLING WATER SYSTEM, SO<sub>2</sub> CONTROL, COMBUSTION TECHNOLOGY, AIR DISPERSION MODEL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|    | <p><b>IFC Comment ( II-4) : Alternative analysis</b></p> <p>a) Cooling system: once through cooling system Vs closed wet cooling system-cost, impacts other considerations, decision.</p> <p>b) SO<sub>2</sub> control : Sulfur content approach ( without Flue Gas Desulphurization ), Flue Gas Desulphurization ( FGD with Sea Water, Limestone Gypsum)-Cost, Impacts, other considerations, decision</p> <p>c) Combustion technology: supercritical (e.g. 24.7 MPa/535 C/40.6%, 27 MPa/585C/42.3%, 29.5MPa/595 C/43.2% LHV net), ultra supercritical.</p> <p>d) Air dispersion model used: ISCST3 vs. AERMOD</p> <p><b>Reply:</b></p> <p><b>a) Cooling System:</b></p> <p><b>Technical Comparison:</b></p> <p>Once thorough system involve a sea water intake and discharge channels (5 to 7 km length each) carrying sea water (of 6, 00,000 m<sup>3</sup>/hour). The channels are susceptible for siltation and will require continuous maintenance dredging operations. The quantum of maintenance dredging is estimated to be 0.8 million m<sup>3</sup>/year. A recirculation system with a Cooling Tower (CT), on the other hand, requires very low sea water flow (25,000 to 30,000 m<sup>3</sup>/hour) which can be conveyed through pipes; hence the recirculation system requires additional space for cooling towers (1000m x 600m) in the plant and additional length of piping.</p> |

Once through system can provide cooling water at  $\sim 30^{\circ}\text{C}$  as compared to  $\sim 32^{\circ}\text{C}$  provided by the recirculation system. This will result in approximately 0.5% better plant heat rate and hence a lower operating cost.

Forced Draft Cooling Tower (FDCT) of the size under consideration are not so far executed by Indian contractors. And its completion schedule of about 36 months for first unit also will not be suitable for the completion schedule planned. While Induced Draft Cooling Tower (IDCT) is technically feasible, operating experience of cluster of IDCT handling sea water (10 to 15 tower) needs to be investigated in detail before adoption. Finally, locating large CT structures in a earthquake zone was also considered to be a risk that was not worth taking.

#### **Economic Comparison**

Cost for intake /discharge channel system (for once through system) and cooling towers were obtained through budgetary quotations. Other costs were generated from in-house data. The detailed cost comparison between the two types of systems was made (TCE, 2006, Annexure 2) and it was decided to use the seawater cooling system (TCE, 2006).

#### **b) SO<sub>2</sub> Control :**

##### **Technical Comparison:**

Seawater is alkaline by nature, and has a substantial capacity to absorb and neutralize an acidic gas like sulfur dioxide ( $\text{SO}_2$ ). When  $\text{SO}_2$  is absorbed in seawater, the end product is dissolved sulfate, which is already one of the major constituents of seawater. The process does not require the addition of any chemicals; only seawater and air are used. Another advantage is that no solids are formed in the process, and hence there are no land disposal issues, nor scaling in the process equipment.

### Economic Comparison:

The SO<sub>2</sub> emission standards of International Finance Corporation (IFC) are as follows:

- 1) Total emissions < 0.2 \* MW (up to 500 MW) + 0.1 \* (MW – 500) in Metric tons/day
- 2) Stack concentration less than 2,000 mg/Nm<sup>3</sup> (dry at 6% Oxygen)
- 3) Ground Level Maximum Concentration (MAGLC) should be less than National Standards.

### SO<sub>2</sub> Control Strategy

CGPL has decided to use very low sulfur coal and not a Flue Gas Desulphurization (FGD) to control SO<sub>2</sub> emissions since the unitized cost (Rs/Ton SO<sub>2</sub> removed) is much less for the former approach. This is demonstrated by an illustrative calculation below. Indonesian coal with 0.8 wt% sulfur is approximately Rs. 25/ton cheaper than the coal with 0.6 wt% sulfur with all other parameters being the same (ADARO, 2007). Thus, the cost of SO<sub>2</sub> control by purchasing lower S coal can be estimated as:

$$\text{Cost of reducing SO}_2 = (\text{Rs. 25/ton coal}) * [1 \text{ ton coal} / \{(0.008 - 0.006) * 2\} \text{ ton SO}_2]$$

$$= \text{Rs.6,250/ton SO}_2$$

The least expensive FGD system for the UMPP would have been sea water scrubbing. One FGD system for an 800 MW boiler would cost approximately Rs. 350 Crore (MHI, 2007) and it will remove 90% SO<sub>2</sub> from the flue gas. The amount of SO<sub>2</sub> removed from one boiler would be:

$$\text{SO}_2 \text{ Removed by One FGD System} = (392/5) * 0.9 = 70.56 \text{ tpd of SO}_2.$$

$$\text{Annual SO}_2 \text{ Removed} = 70.56 \text{ tpd} * 365 \text{ (days/yr)} * 0.9 \text{ (Power Load Factor)} = 23,181 \text{ tons/year}$$

We have estimated the annualized cost of the FGD system assuming the annual capital charges of 15% of the investment, and that 1% of the power of the 800 MW unit is used by the fan and the pumps. The power consumption assumption is based on TPC's experience with sea water FGD system at the Trombay Thermal Station in Mumbai, INDIA. The cost of labor, supervision and repairs is neglected for this analysis.

$$\begin{aligned} \text{Cost of reducing SO}_2 &= \{ \text{Rs. 350 Crore} * 0.15 + 0.01 * (800,000 * 0.9 * 8,760 * \text{Rs. 2.15/kWh}) \} \\ &= \text{Rs. 52.5 Crore} + \text{Rs. 13.4 Crore} = \text{Rs. 65.9 Crore/year} \end{aligned}$$

$$\begin{aligned} \text{Thus, the cost of reducing SO}_2 &= \text{Rs. 65.6 (Crore/yr)/23,181 (Tons/yr)} \\ &= \text{Rs. 28,255/ton SO}_2. \end{aligned}$$

As can be seen from the above conservative estimate, the cost of SO<sub>2</sub> reduction to meet the 450 tons/day limit is more than twice for a FGD system as that of using low sulfur coal.

c) Ultra supercritical or sub-critical technologies were not evaluated since the Request for Proposal (RFP) from Power Finance Corporation (PFC) specified supercritical technology with the following parameters: High Pressure Turbine inlet P = 242.2 bars, T = 565 C, Reheat T = 593 C

d) TCE has used US EPA approved model ISC3-3. This is the only model that is recommended by the Ministry of Environment and Forests (MOEF) of the Government of India (GOI) while AERMOD has been recently recommended by the US EPA. CGPL did not use AERMOD for the following reasons:

- 1) MOEF does not accept it yet
- 2) It is designed to account for downwash effects when there are several buildings or hills in the vicinity of the plant. This is not the case in Mundra- a flat and barren terrain.
- 3) AERMOD requires extensive data on mixing heights and other parameters that are not available in India

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5. | <b>DETAILS GHG EMISSION ASSESSMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    | <p><b>IFC Comment ( II-5) : Details GHG emissions assessment</b></p> <p><b>a) tCO<sub>2</sub>/year, gCO<sub>2</sub>/kWh at what specific design specifications, compared against the baseline and estimated GHG reduction by UMPP</b></p> <p><b>b) Draft PDD</b></p> <p><b>c) Power Saving and contribution to improvement of GHG performance by not having FGD</b></p> <p><b>Reply:</b></p> <p>a) This point is covered in item I-19 of Part I</p> <p>b) The draft PDD is completed by Ernst and Young and will be sent separately.</p> <p>c) Since 1% power will be saved by not having the FGD, the total power saving per day will be 0.96 Million Units and CO<sub>2</sub> emission reduction will be 292934 ton per year, since more coal will have to be burnt to get the same net power output of FGD were used</p> |
| 6. | <b>CUMULATIVE IMPACT ASSESSMENT OF UMPP &amp; APPL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    | <p><b>IFC Comment ( II-6) : Cumulative impact assessment of UMPP &amp; APPL</b></p> <p><b>a) Cumulative air quality impact assessment (particularly at maximum worst case location for UMPP, and sensitive receptors.</b></p> <p><b>b) Cumulative seawater intake/discharge impact assessment.</b></p> <p><b>Reply :</b></p> <p>a) The location of power plant proposed by APPL is approximately 2-3 Km away from UMPP. The concentrations of SO<sub>2</sub>,</p>                                                                                                                                                                                                                                                                                                                                                           |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p>NOx and SPM under worst case scenario due to cumulative effect will be 10 to 15 % higher. The details are given in Annexure-2.</p> <p>b) The APPL is proposing the cooling towers for their proposed plant. There will not be any effect on the sea water due to APPL power plant.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 7. | <b>MARINE EIA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    | <p><b>IFC Comment ( III-7) : Copy of Marine EIA</b></p> <p><b>Reply:</b> Copy of marine EIA will be enclosed separately.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 8. | <b>PRECOOLING EFFECT BY OUTFALL CHANNEL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|    | <p><b>IFC comment ( II-8): Pre-cooling effect by the outfall channel ( total temperature drop)</b></p> <p>a) <b>Design temperature difference between inlet and outlet of the condenser</b></p> <p>b) <b>Design temperature difference between inlet and outlet of the intake point and outfall point.</b></p> <p>c) <b>Temperature difference at the edge of the mixing zone</b></p> <p>d) <b>Feasibility of increasing retention pondage in the channel to achieve 3C at he edge of mixing zone.</b></p> <p><b>Reply:</b></p> <p>a) Design temperature difference between inlet and outlet of the condenser is 7.5 degrees.</p> <p>b) Design temperature difference between inlet of the intake point and output of outfall point is 4° C</p> <p>c) Temperature difference at the edge of the mixing zone will be less than 4° C</p> |

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|     |                                                                                                                                                                                                                                                                                                                          |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.  | <b>INTAKE &amp; OUTFALL CHANNEL DESIGN</b>                                                                                                                                                                                                                                                                               |
|     | <p><b>IFC comment ( II-9 ) : DHI study of intake and outfall channel design</b></p> <p><b>Reply:</b> This part is covered in item II-4 of Part I.</p>                                                                                                                                                                    |
| 10. | <b>T-LINE / POWER GRIDS ESPP REVIEW</b>                                                                                                                                                                                                                                                                                  |
|     | <p><b>IFC comment ( II- 10 ) : T-line / power Grid's ESPP review to demonstrate that Power Grid's ESA is generally consistent with IFC's performance standards</b></p> <p><b>Reply:</b> This comment is answered in detail Item I-11 in Part I. Power grid design will be consistent with IFC performance standards.</p> |
| 11. | <b>NO<sub>x</sub> EMISSION</b>                                                                                                                                                                                                                                                                                           |
|     | <p><b>IFC comment ( II-11) : Confirmation of NO<sub>x</sub> emission 650 mg/Nm<sup>3</sup> at 6% O<sub>2</sub></b></p> <p><b>Reply:</b> This Point is covered in Item I-17 of part I. The emission will be &lt;750 mg/Nm<sup>3</sup> (Dry, 6% O<sub>2</sub>)</p>                                                         |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12. | <b>MAPS &amp; PLANS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|     | <p><b>IFC comment ( II-12): Maps and Plans</b></p> <ul style="list-style-type: none"> <li>a) Site Boundary</li> <li>b) Plant layout</li> <li>c) Land Owners Plot ( Map Showing Survey Number)</li> <li>d) Map showing the regions of Mundra Port , proposed jetty, APPL, UMPP and affected nearby villages</li> <li>e) Layout map for labor camps</li> </ul> <p><b>Reply:</b></p> <ul style="list-style-type: none"> <li>a &amp; b) Site Boundary and Plot plan is enclosed as annexure-6</li> <li>c) Map survey number is enclosed as Annexure-7.</li> <li>d) Map will be separately submitted by CGPL to IFC</li> <li>e) Layout map for labor camps is under preparation and will be submitted later.</li> </ul> |
| 13. | <b>COPY OF PRESENTATION BY PFC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|     | <p><b>IFC comment ( II-13) : Copy of presentation used by PFC at the Sept. 19, 2006, environmental public hearing</b></p> <p><b>Reply:</b> The Presentation is enclosed as annexure-5.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14. | <b>POST APRIL2007 CONSULTATION MATERIAL USED BY CGPL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|     | <p><b>IFC comment (II-14): Post April 2007 consultation materials used/being used by CGPL.</b></p> <p><b>Reply:</b> CGPL staff has been meeting the local people frequently. However, no printed material has been used for distribution to the common public.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 15. | <b>POST SOCIAL DOCUMENTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|     | <p><b>IFC comment ( II-15) : Post Social documents</b></p> <p><b>a) Draft Rapid SIA</b></p> <p><b>Reply:</b> This document, and associated appendices, will be submitted separately by CGPL to IFC</p> <p><b>b) HR manual</b></p> <p><b>Reply:</b> Please go through the HR Manual, and several related policies, of TPC displayed at <a href="http://www.tpc.com">www.tpc.com</a>. CGPL will have a HR policy which will be modeled after that of TPC.</p> <p><b>c) Tata Power CSR report.</b></p> <p><b>Reply:</b> A Corporate Social Responsibility (CSR) report is available on TPC web site i.e. <a href="http://www.tatapower.com">www.tatapower.com</a>. CGPL, again, will endeavor to have a similar CSR activity.</p> |
| 16. | <b>OTHER S&amp;E INFORMATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|     | <p><b>IFC comment ( II-16) : Other S&amp;E information as identified through review of the above/completion of IFC S&amp; E appraisal</b></p> <p><b>Reply:</b> Not Applicable</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**REFERENCES: PART I**

CEIA 2007: Comprehensive Environmental Impact Assessment Study Report for 4,000 MW , Mundra Ultra Mega Power Plant (UMPP), Tata Consulting Engineers (TCE), August 2007

E&Y 2007: Emission Reductions for UMPP Mundra, Draft EXCEL file, October 2007.

KALTIM 2007: Coal Purchase Agreement with Kaltim Prima Coal, Indonesia, 2007.

NIO 2007: Rapid Marine EIA, Mundra UMPP, National Institute of Oceanography, January 2007.

PGC 2006 : Environmental And Social Policy & Procedures (Esp) Executive Summary

TCE 2006: Cooling Water Study No. No. 5146A-ME-613- BS-56, 2006

TCE. 2006: Concept Note On Coal Handling System ME-563-CN-41

US EPA 1998: AP-42, (5<sup>th</sup> Edition, Vol. I; Ch. 1 Table 1.1.-3, Footnote b), September 1998

See <http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s01.pdf>

**REFERENCES: PART II**

ADARO 2007: Conversation with representative of ADARO Coal of Indonesia, November 2007.

MHI 2007: Budgetary Estimate for Sea Water Scrubbing FGD System for 800 MW Boiler, May 2007

TCE 2006: Cooling Water Study No. No. 5146A-ME-613- BS-56, 2006

## **COASTAL GUJARAT POWER LIMITED**

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**ANNEXTURE -1**

**GROUND LEVEL CONCENTRATIONS  
(GLCs)  
AT MONITORING STATIONS**

## INTRODUCTION

This annexure summarizes the GLC values at the eight (8) monitoring stations for SO<sub>2</sub>, NO<sub>x</sub> and PM as a result of the UMPP in Mundra. The 24-hour and annual average values are given.

## INPUT DATA

The data used for the ISCATT-3 model are given in Table I-1 below. The major assumptions are:

- 1) Power Load Factor = 90%
- 2) Sulfur to SO<sub>2</sub> = 95%

**Table (1): Operating Conditions of UMPP used as Input for ISCATT-3**

| Parameter               | Values          | Units                                         |
|-------------------------|-----------------|-----------------------------------------------|
| Calorific Value of Coal | 5,350           | Kcal/Kg                                       |
| Sulfur Content          | 0.6             | %                                             |
| Ash Content             | 15              | %                                             |
| Coal Firing rate/UMPP   | 34,389          | TPD for 4,000 MW                              |
| Coal Firing rate/boiler | 287             | TPH for 800 MW                                |
| <b>Stack Parameters</b> |                 |                                               |
| Stack Height            | 275             | m                                             |
| Stack Numbers           | 2( 3 + 2 flues) | Number                                        |
| Exit Temperature        | 134.5           | °C                                            |
| Volumetric Flow//Stack  | 1,036           | m <sup>3</sup> /s                             |
| <b>Heat Input</b>       |                 |                                               |
| Heat Input              | 1.53E+09        | Kcal/hr                                       |
| Heat Input              | 1.8             | GJ/s                                          |
| Normal Flue Gas Flow    | 624.0           | Nm <sup>3</sup> /s (dry, 6% O <sub>2</sub> )* |
| <b>Emissions/Stack</b>  |                 |                                               |
| SO <sub>2</sub>         | 907.4           | g/s                                           |
| NO <sub>x</sub>         | 429.1           | g/s                                           |
| SPM                     | 28.7            | g/s                                           |
| SO <sub>2</sub>         | 1,454.1         | mg/Nm <sup>3</sup>                            |
| NO <sub>x</sub>         | 687.6           | mg/Nm <sup>3</sup>                            |
| SPM                     | 45.9            | mg/Nm <sup>3</sup>                            |

\*: Based on unitized normal flue gas flow = 350 Nm<sup>3</sup>/GJ (dry, 6% O<sub>2</sub>) as per IFC guidelines

**TABLE (1a): Predicted 24-hr Maximum GLC of SO<sub>2</sub> (March 2006 to February 2007)**

| <i>Sr. No.</i>                                                                | <i>Location</i> | <i>Distance and direction</i> | <i>24 hourly Max. baseline SO<sub>2</sub> Conc. (µg/m<sup>3</sup>)</i> | <i>Incremental SO<sub>2</sub> GLC (µg/m<sup>3</sup>)</i> | <i>Total SO<sub>2</sub> Predictive GLC (µg/m<sup>3</sup>)</i> |
|-------------------------------------------------------------------------------|-----------------|-------------------------------|------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|
| 1                                                                             | Tunda village   | 0                             | 16.2                                                                   | 0                                                        | 16.2                                                          |
| 2                                                                             | Jarpara         | 9 Km, E                       | 16.8                                                                   | 16.3                                                     | 33.1                                                          |
| 3                                                                             | Desalpar        | 7 Km, NNE                     | 15.4                                                                   | 23.5                                                     | 38.9                                                          |
| 4                                                                             | Mota Bhojapur   | 6 Km, NE                      | 18.4                                                                   | 12.7                                                     | 31.1                                                          |
| 5                                                                             | Tragadi         | 6 Km, W                       | 16.4                                                                   | 14.9                                                     | 31.3                                                          |
| 6                                                                             | Pipari          | 10 Km. NW                     | 16.2                                                                   | 13.9                                                     | 30.1                                                          |
| 7                                                                             | Bidada          | 7 Km, NNE                     | 16.8                                                                   | 11.5                                                     | 28.3                                                          |
| 8                                                                             | Kandagara       | 3 Km, N                       | 16.4                                                                   | 13.5                                                     | 29.9                                                          |
| NAAQS Limit (Rural & Residential) for SO <sub>2</sub> is 80 µg/m <sup>3</sup> |                 |                               |                                                                        |                                                          |                                                               |

**TABLE (1b): Predicted 24-hr Maximum GLC of NO<sub>2</sub> (March 2006 to February 2007)**

| <i>Sr. No.</i>                                                                | <i>Location</i> | <i>Distance and direction</i> | <i>24 hourly Max. baseline NO<sub>2</sub> Conc. (µg/m<sup>3</sup>)</i> | <i>Incremental NO<sub>2</sub> GLC (µg/m<sup>3</sup>)</i> | <i>Total NO<sub>2</sub> Predictive GLC (µg/m<sup>3</sup>)</i> |
|-------------------------------------------------------------------------------|-----------------|-------------------------------|------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|
| 1                                                                             | Tunda village   | 0                             | 23.4                                                                   | 0                                                        | 23.4                                                          |
| 2                                                                             | Jarpara         | 9 Km, E                       | 22.8                                                                   | 9.6                                                      | 32.4                                                          |
| 3                                                                             | Desalpar        | 7 Km, NNE                     | 22.8                                                                   | 13.8                                                     | 36.6                                                          |
| 4                                                                             | Mota Bhojapur   | 6 Km, NE                      | 24.8                                                                   | 7.4                                                      | 32.2                                                          |
| 5                                                                             | Tragadi         | 6 Km, W                       | 23.5                                                                   | 8.7                                                      | 32.2                                                          |
| 6                                                                             | Pipari          | 10 Km. NW                     | 22                                                                     | 8.1                                                      | 30.1                                                          |
| 7                                                                             | Bidada          | 7 Km, NNE                     | 22.8                                                                   | 7.3                                                      | 30.1                                                          |
| 8                                                                             | Kandagara       | 3 Km, N                       | 22.8                                                                   | 7.9                                                      | 30.7                                                          |
| NAAQS Limit (Rural & Residential) for NO <sub>2</sub> is 80 µg/m <sup>3</sup> |                 |                               |                                                                        |                                                          |                                                               |

**TABLE (1c): Predicted 24-hr Maximum GLC of SPM (March 2006 to February 2007)**

| <i>Sr. No.</i>                                                                              | <i>Location</i> | <i>Distance and direction</i> | <i>24 hourly Max. baseline SPM Conc. (<math>\mu\text{g}/\text{m}^3</math>)</i> | <i>Incremental SPM GLC (<math>\mu\text{g}/\text{m}^3</math>)</i> | <i>Total SPM Predictive GLC (<math>\mu\text{g}/\text{m}^3</math>)</i> |
|---------------------------------------------------------------------------------------------|-----------------|-------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------|
| 1                                                                                           | Tunda village   | 0                             | 138                                                                            | 0                                                                | 138.0                                                                 |
| 2                                                                                           | Jarpara         | 9 Km, E                       | 138                                                                            | 1.4                                                              | 139.4                                                                 |
| 3                                                                                           | Desalpar        | 7 Km, NNE                     | 139                                                                            | 2.0                                                              | 141.0                                                                 |
| 4                                                                                           | Mota Bhojapur   | 6 Km, NE                      | 142                                                                            | 1.1                                                              | 143.1                                                                 |
| 5                                                                                           | Tragadi         | 6 Km, W                       | 134                                                                            | 1.3                                                              | 135.3                                                                 |
| 6                                                                                           | Pipari          | 10 Km. NW                     | 134                                                                            | 1.3                                                              | 135.3                                                                 |
| 7                                                                                           | Bidada          | 7 Km, NNE                     | 142                                                                            | 1.0                                                              | 143.0                                                                 |
| 8                                                                                           | Kandagara       | 3 Km, N                       | 134                                                                            | 1.1                                                              | 135.1                                                                 |
| NAAQS Limit (Rural & Residential) for SPM is <b>200 <math>\mu\text{g}/\text{m}^3</math></b> |                 |                               |                                                                                |                                                                  |                                                                       |

**TABLE (1d): Predicted Annual Average GLC of SO<sub>2</sub> (March 2006 to February 2007)**

| <i>Sr. No.</i>                                                                                         | <i>Location</i> | <i>Distance and direction</i> | <i>Annual Avg. baseline SO<sub>2</sub> Conc. (<math>\mu\text{g}/\text{m}^3</math>)</i> | <i>Incremental SO<sub>2</sub> GLC (<math>\mu\text{g}/\text{m}^3</math>)</i> | <i>Total SO<sub>2</sub> Predictive GLC (<math>\mu\text{g}/\text{m}^3</math>)</i> |
|--------------------------------------------------------------------------------------------------------|-----------------|-------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 1                                                                                                      | Tunda village   | 0                             | 11.0                                                                                   | 0                                                                           | 11.0                                                                             |
| 2                                                                                                      | Jarpara         | 9 Km, E                       | 11.7                                                                                   | 0.5                                                                         | 12.2                                                                             |
| 3                                                                                                      | Desalpar        | 7 Km, NNE                     | 11.8                                                                                   | 1.7                                                                         | 13.5                                                                             |
| 4                                                                                                      | Mota Bhojapur   | 6 Km, NE                      | 12.3                                                                                   | 2.7                                                                         | 15.0                                                                             |
| 5                                                                                                      | Tragadi         | 6 Km, W                       | 11.1                                                                                   | 1.3                                                                         | 12.4                                                                             |
| 6                                                                                                      | Pipari          | 10 Km. NW                     | 10.7                                                                                   | 3.2                                                                         | 13.9                                                                             |
| 7                                                                                                      | Bidada          | 7 Km, NNE                     | 12.8                                                                                   | 1.6                                                                         | 14.4                                                                             |
| 8                                                                                                      | Kandagara       | 3 Km, N                       | 10.9                                                                                   | 2.7                                                                         | 13.6                                                                             |
| NAAQS Limit (Rural & Residential) for SO <sub>2</sub> is <b>60 <math>\mu\text{g}/\text{m}^3</math></b> |                 |                               |                                                                                        |                                                                             |                                                                                  |

**TABLE (1e): Predicted Annual Average GLC of NO<sub>2</sub> (March 2006 to February 2007)**

| <i>Sr. No.</i>                                                                      | <i>Location</i> | <i>Distance and direction</i> | <i>Annual Avg. baseline NO<sub>2</sub> Conc. (µg/m<sup>3</sup>)</i> | <i>Incremental NO<sub>2</sub> GLC (µg/m<sup>3</sup>)</i> | <i>Total NO<sub>2</sub> Predictive GLC (µg/m<sup>3</sup>)</i> |
|-------------------------------------------------------------------------------------|-----------------|-------------------------------|---------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|
| 1                                                                                   | Tunda village   | 0                             | 15.8                                                                | 0                                                        | 15.8                                                          |
| 2                                                                                   | Jarpara         | 9 Km, E                       | 16.9                                                                | 0.3                                                      | 17.2                                                          |
| 3                                                                                   | Desalpar        | 7 Km, NNE                     | 16.8                                                                | 1.0                                                      | 17.8                                                          |
| 4                                                                                   | Mota Bhojapur   | 6 Km, NE                      | 17.3                                                                | 1.6                                                      | 18.9                                                          |
| 5                                                                                   | Tragadi         | 6 Km, W                       | 15.9                                                                | 0.8                                                      | 16.7                                                          |
| 6                                                                                   | Pipari          | 10 Km. NW                     | 15.4                                                                | 1.9                                                      | 17.3                                                          |
| 7                                                                                   | Bidada          | 7 Km, NNE                     | 18.2                                                                | 0.9                                                      | 19.1                                                          |
| 8                                                                                   | Kandagara       | 3 Km, N                       | 16.6                                                                | 1.6                                                      | 18.2                                                          |
| NAAQS Limit (Rural & Residential) for NO <sub>2</sub> is <b>60 µg/m<sup>3</sup></b> |                 |                               |                                                                     |                                                          |                                                               |

**TABLE (1f): Predicted Annual Average GLC of SPM (March 2006 to February 2007)**

| <i>Sr. No.</i>                                                           | <i>Location</i> | <i>Distance and direction</i> | <i>Annual Avg. baseline SPM Conc. (µg/m<sup>3</sup>)</i> | <i>Incremental SPM GLC (µg/m<sup>3</sup>)</i> | <i>Total SPM Predictive GLC (µg/m<sup>3</sup>)</i> |
|--------------------------------------------------------------------------|-----------------|-------------------------------|----------------------------------------------------------|-----------------------------------------------|----------------------------------------------------|
| 1                                                                        | Tunda village   | 0                             | 105.5                                                    | 0                                             | 105.50                                             |
| 2                                                                        | Jarpara         | 9 Km, E                       | 111.0                                                    | 0.04                                          | 111.04                                             |
| 3                                                                        | Desalpar        | 7 Km, NNE                     | 115.4                                                    | 0.14                                          | 115.54                                             |
| 4                                                                        | Mota Bhojapur   | 6 Km, NE                      | 112.3                                                    | 0.23                                          | 112.53                                             |
| 5                                                                        | Tragadi         | 6 Km, W                       | 107.6                                                    | 0.11                                          | 107.71                                             |
| 6                                                                        | Pipari          | 10 Km. NW                     | 105.2                                                    | 0.27                                          | 105.47                                             |
| 7                                                                        | Bidada          | 7 Km, NNE                     | 113.9                                                    | 0.13                                          | 114.03                                             |
| 8                                                                        | Kandagara       | 3 Km, N                       | 109.6                                                    | 0.22                                          | 109.82                                             |
| NAAQS Limit (Rural & Residential) for SPM is <b>140 µg/m<sup>3</sup></b> |                 |                               |                                                          |                                               |                                                    |

**TABLE (1g): Maximum Incremental GLCs of SO<sub>2</sub>, NO<sub>2</sub> and SPM due to UMPP**

| <b>Sl.No.</b> | <b>GLCs</b>       | <b>Bearing and location</b> | <b>SO<sub>2</sub></b> | <b>NO<sub>2</sub></b> | <b>SPM</b> |
|---------------|-------------------|-----------------------------|-----------------------|-----------------------|------------|
| 1             | 24-Hourly Maximum | 5.4 km, SW                  | 33.7                  | 19.7                  | 2.9        |
| 2             | Annual Average    | 1.6 km, SE                  | 4.5                   | 2.6                   | 0.4        |

**TABLE (1h): Incremental GLCs of SO<sub>2</sub>, NO<sub>2</sub> and SPM at a point 2km East from UMPP Site**

| <b>Sl.No.</b> | <b>GLCs</b>       | <b>SO<sub>2</sub></b> | <b>NO<sub>2</sub></b> | <b>SPM</b> |
|---------------|-------------------|-----------------------|-----------------------|------------|
| 1             | 24-Hourly Maximum | 16.4                  | 9.6                   | 1.4        |
| 2             | Annual Average    | 3.6                   | 2.1                   | 0.3        |

**ANNEXTURE -2**

**CUMULATIVE SO<sub>2</sub> IMPACT ANALYSIS  
DUE TO  
UMPP AND ADANI**

Table (2a): Total Predicted 24 hourly Maximum GLC of SO<sub>2</sub> for the Period from March 2006 to February 2007 Cumulative Effect of UMPP and Adani Power Projects

| S. No.                                                                        | Location      | Distance and Direction | 24 hourly Max. baseline SO <sub>2</sub> Conc. (µg/m <sup>3</sup> ) | Incremental SO <sub>2</sub> GLC (µg/m <sup>3</sup> ) by UMPP | Incremental SO <sub>2</sub> GLC (µg/m <sup>3</sup> ) by APPL | Incremental SO <sub>2</sub> GLC (µg/m <sup>3</sup> ) CUMULATIVE | Total SO <sub>2</sub> Predictive GLC (µg/m <sup>3</sup> ) |
|-------------------------------------------------------------------------------|---------------|------------------------|--------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------|
| 1                                                                             | Tunda village | 0                      | 16.2                                                               | 0                                                            | 0.0                                                          | 0                                                               | 16.2                                                      |
| 2                                                                             | Jarpara       | 9 Km, E                | 16.8                                                               | 16.3                                                         | 3.3                                                          | 19.6                                                            | 36.4                                                      |
| 3                                                                             | Desalpar      | 7 Km, NNE              | 15.4                                                               | 23.5                                                         | 3.2                                                          | 26.7                                                            | 42.1                                                      |
| 4                                                                             | Mota Bhojapur | 6 Km, NE               | 18.4                                                               | 12.7                                                         | 2.2                                                          | 14.9                                                            | 33.3                                                      |
| 5                                                                             | Tragadi       | 6 Km, W                | 16.4                                                               | 14.9                                                         | 1.7                                                          | 16.6                                                            | 33.0                                                      |
| 6                                                                             | Pipari        | 10 Km. NW              | 16.2                                                               | 13.9                                                         | 1.9                                                          | 15.8                                                            | 32.0                                                      |
| 7                                                                             | Bidada        | 7 Km, NNE              | 16.8                                                               | 11.5                                                         | 1.6                                                          | 13.1                                                            | 29.9                                                      |
| 8                                                                             | Kandagara     | 3 Km, N                | 16.4                                                               | 13.5                                                         | 1.3                                                          | 14.8                                                            | 31.2                                                      |
| NAAQS Limit (Rural & Residential) for SO <sub>2</sub> is 80 mg/m <sup>3</sup> |               |                        |                                                                    |                                                              |                                                              |                                                                 |                                                           |

Figure (2a): Isopleth of Predicted Incremental 24 hourly Maximum GLC of SO<sub>2</sub> (March 2006 to February 2007) Cumulative Effect of UMPP and Adani Power Projects

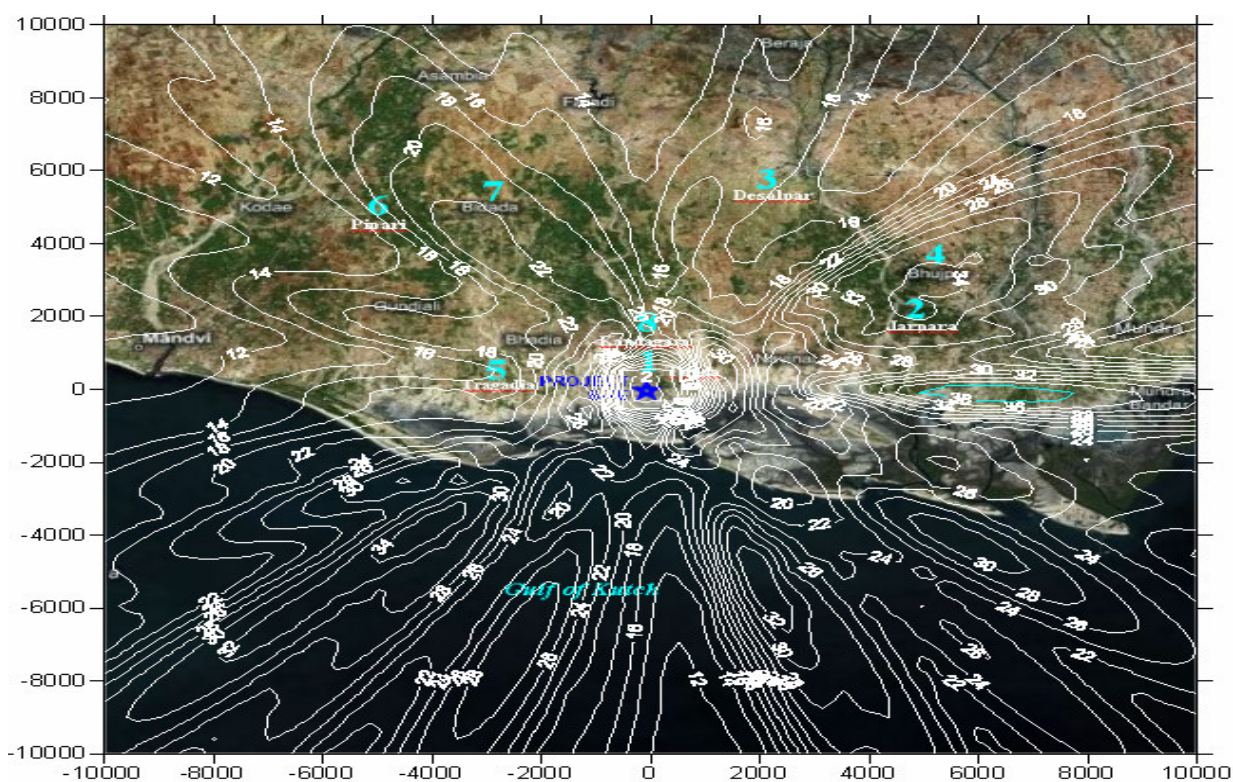


Table (2b): Total Predicted Annual Average GLC of SO<sub>2</sub> for the Period from March 2006 to February 2007 Cumulative Effect of UMPP and Adani Power Projects

| S. No.                                                                        | Location      | Distance and Direction | Annual Avg. baseline SO <sub>2</sub> Conc. (µg/m <sup>3</sup> ) | Incremental SO <sub>2</sub> GLC (µg/m <sup>3</sup> ) by UMPP | Incremental SO <sub>2</sub> GLC (µg/m <sup>3</sup> ) by APPL | Incremental SO <sub>2</sub> GLC (µg/m <sup>3</sup> ) CUMULATIVE | Total SO <sub>2</sub> Predictive GLC (µg/m <sup>3</sup> ) |
|-------------------------------------------------------------------------------|---------------|------------------------|-----------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------|
| 1                                                                             | Tunda village | 0                      | 11.0                                                            | 0                                                            | 0                                                            | 0                                                               | 11.0                                                      |
| 2                                                                             | Jarpara       | 9 Km, E                | 11.7                                                            | 0.5                                                          | 0.1                                                          | 0.6                                                             | 12.3                                                      |
| 3                                                                             | Desalpar      | 7 Km, NNE              | 11.8                                                            | 1.7                                                          | 0.4                                                          | 2.1                                                             | 13.9                                                      |
| 4                                                                             | Mota Bhojapur | 6 Km, NE               | 12.3                                                            | 2.7                                                          | 0.4                                                          | 3.1                                                             | 15.4                                                      |
| 5                                                                             | Tragadi       | 6 Km, W                | 11.1                                                            | 1.3                                                          | 0.3                                                          | 1.6                                                             | 12.7                                                      |
| 6                                                                             | Pipari        | 10 Km. NW              | 10.7                                                            | 3.2                                                          | 0.2                                                          | 3.4                                                             | 14.1                                                      |
| 7                                                                             | Bidada        | 7 Km, NNE              | 12.8                                                            | 1.6                                                          | 0.2                                                          | 1.8                                                             | 14.6                                                      |
| 8                                                                             | Kandagara     | 3 Km, N                | 10.9                                                            | 2.7                                                          | 0.5                                                          | 3.2                                                             | 14.1                                                      |
| NAAQS Limit (Rural & Residential) for SO <sub>2</sub> is 60 µg/m <sup>3</sup> |               |                        |                                                                 |                                                              |                                                              |                                                                 |                                                           |

Figure (2b): Isopleth of Predicted Incremental Annual Average GLC of SO<sub>2</sub> (March 2006 to February 2007) Cumulative Effect of UMPP and Adani Power Projects

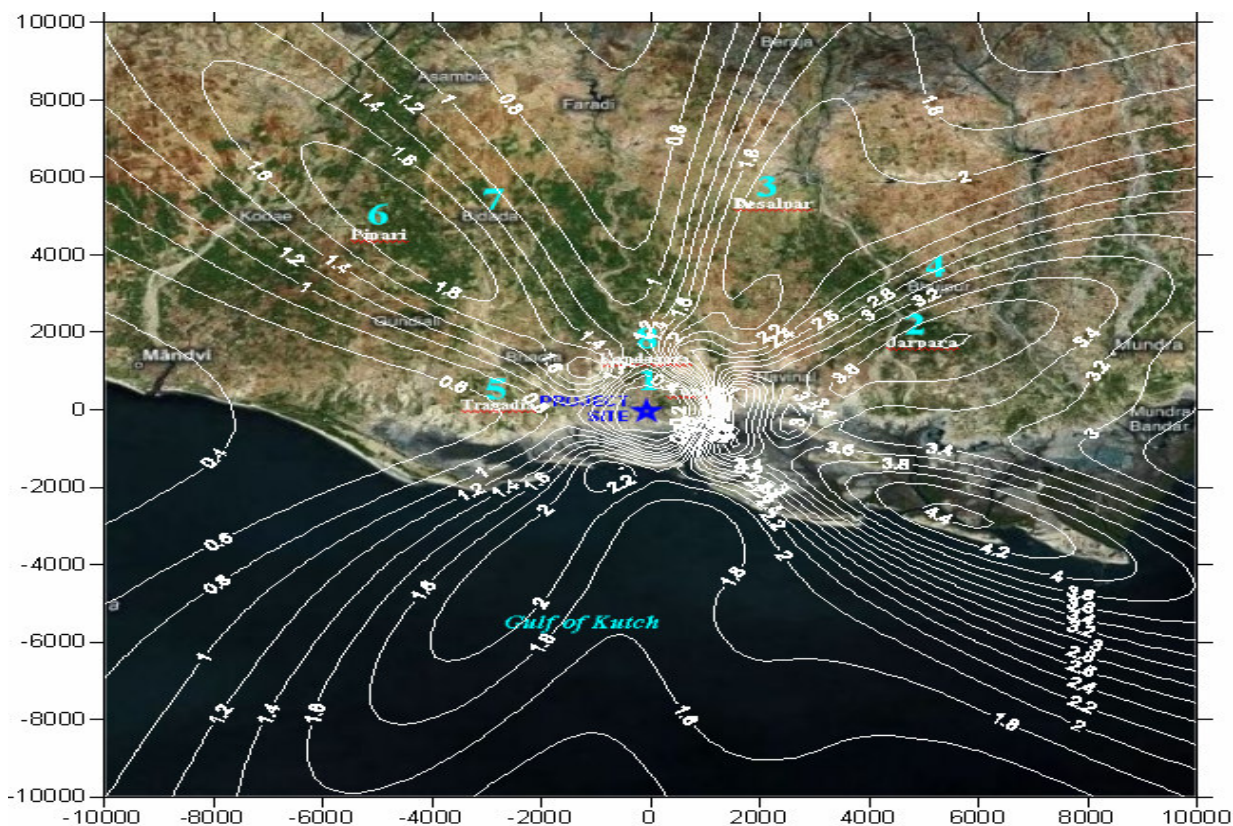


**Table (2c): Maximum Incremental GLC of SO<sub>2</sub>**

| <b>Sl.No.</b> | <b>GLCs</b>       | <b>Distance and Direction</b> | <b>SO<sub>2</sub></b> |
|---------------|-------------------|-------------------------------|-----------------------|
| 1             | 24-Hourly Maximum | 5.4 km, SW                    | 35.6                  |
| 2             | Annual Average    | 1.6 km, SE                    | 4.5                   |

**Table (2d): Incremental GLC of SO<sub>2</sub> at a point 2km East from UMPP site**

| <b>Sl.No.</b> | <b>GLCs</b>       | <b>SO<sub>2</sub></b> |
|---------------|-------------------|-----------------------|
| 1             | 24-Hourly Maximum | 16.6                  |
| 2             | Annual Average    | 3.6                   |