

# BUNDLED WIND ENERGY GENERATION PROJECTS IN GUJARAT, INDIA

Document Prepared By Wind World (India) Limited

|                          |                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Title</b>     | Bundled wind energy generation projects in Gujarat, India                                                                                                         |
| <b>Version</b>           | 4.0                                                                                                                                                               |
| <b>Report ID</b>         | VCS_412                                                                                                                                                           |
| <b>Date of Issue</b>     | 25-July-2014                                                                                                                                                      |
| <b>Project ID</b>        | 412                                                                                                                                                               |
| <b>Monitoring Period</b> | 01-May-2013 to 31-December-2013 (including first and last day)                                                                                                    |
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## 1 PROJECT DETAILS

### 1.1 Summary Description of the Implementation Status of the Project

The project under consideration is set up to produce clean power from the wind electric converters. The generated electricity is wheeled using the state transmission system for captive consumption. The Project leads to reduced greenhouse gas (GHG) emissions because it displaces electricity from fossil fuel based electricity generation plants. The project is helping in bridging the demand supply gap by using wind as a source of generating electrical energy.

The project activity consists of the 72 machines of Enercon make of 800 KW each and 3 machine of Enercon make of 600 KW, totaling to the capacity of 59.4 MW in the state of Gujarat. The generated electricity is supplied to the NEWNE grid comprising mainly fossil fuel based power plants. The Project considered harnesses renewable resources in the region, thereby displacing non-renewable natural resources thereby ultimately leading to sustainable economic and environmental development. Wind World (India) Limited<sup>1</sup> (hereafter referred as "WWIL") is the equipment supplier and the operations and maintenance contractor for the Project.

The first machine under the bundled project activity was commissioned on 30 June 2004 and last machine under the bundled project activity was commissioned on 30 September 2006. The period covered in this monitoring report is from 01-May-2013 to 31-December-2013 (including first and last day).

The total emission reductions achieved under this monitoring period i.e. 01-May-2013 to 31-December-2013 (including first and last day) is 60,563 tCO<sub>2</sub>e.

### 1.2 Sectoral Scope and Project Type

Sectoral scope: Sector 1- "Energy Industries (renewable -/ non renewable sources)"

Type 1: Renewable Energy Project

The project activity is not a grouped project

### 1.3 Project Proponent

The Wind World (India) Limited is the project participant and contact details are provided in the table below:

|                   |                            |
|-------------------|----------------------------|
| Organization name | Wind World (India) Limited |
| Contact person    | Mr. Yogesh Mehra           |
| Title             | Managing Director          |

<sup>1</sup> With effect from 01/01/2013 name of Enercon (India) Limited has been changed to 'Wind World (India) Limited'

|           |                                                                                      |
|-----------|--------------------------------------------------------------------------------------|
| Address   | Wind World Tower, A-9, Veera Industrial Estate, Veera Desai Road, Andheri West       |
| Telephone | +91-22- 66924848                                                                     |
| Email     | <a href="mailto:yogesh.mehra@windworldindia.com">yogesh.mehra@windworldindia.com</a> |

## 1.4 Other Entities Involved in the Project

No other entity is involved in the project.

## 1.5 Project Start Date

Among the project activity bundle, first machine (of Desai Textiles) was commissioned on 30-June-2004.

## 1.6 Project Crediting Period

The project activity has been validated and first verification has been conducted for the period of 1/06/2004 to 31/12/2006 under VCS version 1. Project Participant (PP) mentioned the crediting period based on the monitoring period in the absence of proper guidelines of VCS Board. PP selected fix crediting period of 10 years for the project activity from 1 June 2004 to 31 May 2014.

## 1.7 Project Location

The Project is spread across villages in Satapar, Okhamadhi, Navadra, Bamnasa, Jodhapar and Kurunga of Jamnagar District in state of Gujarat. The latitudinal & longitudinal as well as the unique identification details of individual machines has been provided in Appendix 2.

## 1.8 Title and Reference of Methodology

Title: "Consolidated methodology for grid-connected electricity generation from renewable sources" Reference: Approved consolidated baseline and monitoring methodology ACM0002 Version: Version 6, dated 19 May 2006.

## 1.9 Other Programs

Not applicable.

# 2 IMPLEMENTATION STATUS

## 2.1 Implementation Status of the Project Activity

The first machine under the bundled project activity was commissioned on June 2004 and last machine under the bundled project activity was commissioned on September 2006. The project activity consists of 72 machines of Enercon make of 800 kW each and 3 machine of Enercon make of 600 kW totaling to the capacity of 59.4 MW.

The commissioning schedule for all the WEGs under the project activity has been provided in Appendix 3.

WWIL operation and maintenance activities are ISO certified and all the events are recorded in the log book available at the project site. There is no any major special events for any of the machines occurred during this monitoring period, which may have impact on the applicability of the methodology as well as emission reduction. As a part of regular maintenance the machines are stopped for mechanical and electrical maintenance for 16 to 18 hours annually and for visual inspection for 6 to 7 hours quarterly.

## 2.2 Deviations

### 2.2.1 Methodology Deviations

There has been no methodology deviation in the monitoring plan for the project activity.

### 2.2.2 Project Description Deviations

From August 2010 the company Indo Fashions Pvt Ltd. was merged with the company Surbhi Textile Mills Pvt Ltd, Surat.

This deviation was taken during 4<sup>th</sup> monitoring period (from 01/07/2010 to 31/07/2011) and also valid and applicable for current monitoring period. As the deviation is mainly related to the amalgamation of one entity to other, hence the deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario.

## 2.3 Grouped Project

The project activity is not a grouped project.

## 3 DATA AND PARAMETERS

### 3.1 Data and Parameters Available at Validation

|                  |                                                                                                                                                                                                                                                                                                                                 |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter | EF <sub>OM,y</sub>                                                                                                                                                                                                                                                                                                              |
| Data unit        | tCO <sub>2</sub> e/MWh                                                                                                                                                                                                                                                                                                          |
| Description      | Operating Margin Emission Factor of Western Regional Electricity Grid                                                                                                                                                                                                                                                           |
| Source of data   | <p>"CO<sub>2</sub> Baseline Database for Indian Power Sector", version 01.1 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO<sub>2</sub> Baseline Database for Indian Power Sector", version 01.1 is available at <a href="http://www.cea.nic.in">www.cea.nic.in</a>.</p> |

|                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Value applied:                                                                               | 2002 – 03                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.9814             |
|                                                                                              | 2003 – 04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.9903             |
|                                                                                              | 2004 – 05                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1.0119             |
|                                                                                              | Average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.9945             |
|                                                                                              | Please refer Appendix 1 for details.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |
| Justification of choice of data or description of measurement methods and procedures applied | <p>The Central Electricity Authority (CEA), Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO2 Baseline Database provides information about the Operating Margin and Build Margin Emission Factors of all the regional electricity grids in India. The Operating Margin in the CEA database is calculated ex ante using the Simple OM approach and the Build Margin is calculated ex ante based on 20% most recent capacity additions in the grid based on net generation as described in ACM0002 (version 6). We have, therefore, used the Operating Margin and Build Margin data published in the CEA database, for calculating the Baseline Emission Factor.</p> <p>The Combined Margin (CM) Emission Factor has been calculated as a weighted sum of Operating Margin emission factor and Build Margin emission factor taking the weight age value as 0.75 and 0.25 respectively as per the “Tool to calculate the emission factor for an electricity system” and on the basis of the data available at the time of validation of VCS PD from the publicly available official database on emission factors for all regional grids in India. The detailed calculation and value of CM have been explained in Appendix 1 of MR.</p> |                    |
|                                                                                              | Purpose of the data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Baseline Emissions |
| Comments                                                                                     | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |

|                  |                                                                                                                                                                                                                                                                                                                                 |        |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Data / Parameter | EF <sub>BM,y</sub>                                                                                                                                                                                                                                                                                                              |        |
| Data unit        | tCO <sub>2</sub> e/MWh                                                                                                                                                                                                                                                                                                          |        |
| Description      | Build Margin Emission Factor of Western Regional Electricity Grid.                                                                                                                                                                                                                                                              |        |
| Source of data   | <p>“CO<sub>2</sub> Baseline Database for Indian Power Sector”, version 01.1 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO<sub>2</sub> Baseline Database for Indian Power Sector”, version 01.1 is available at <a href="http://www.cea.nic.in">www.cea.nic.in</a>.</p> |        |
| Value applied:   | 2004 - 05                                                                                                                                                                                                                                                                                                                       | 0.7772 |
|                  | Please refer Appendix 1 for details.                                                                                                                                                                                                                                                                                            |        |

|                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Justification of choice of data or description of measurement methods and procedures applied | <p>The Central Electricity Authority (CEA), Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO2 Baseline Database provides information about the Operating Margin and Build Margin Emission Factors of all the regional electricity grids in India. The Operating Margin in the CEA database is calculated ex ante using the Simple OM approach and the Build Margin is calculated ex ante based on 20% most recent capacity additions in the grid based on net generation as described in ACM0002 (version 6). We have, therefore, used the Operating Margin and Build Margin data published in the CEA database, for calculating the Baseline Emission Factor.</p> <p>The Combined Margin (CM) Emission Factor has been calculated as a weighted sum of Operating Margin emission factor and Build Margin emission factor taking the weight age value as 0.75 and 0.25 respectively as per the "Tool to calculate the emission factor for an electricity system" and on the basis of the data available at the time of validation of VCS PD from the publicly available official database on emission factors for all regional grids in India. The detailed calculation and value of CM have been explained in Appendix 1 of MR.</p> |
| Purpose of the data                                                                          | Baseline Emissions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Comments                                                                                     | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## 3.2 Data and Parameters Monitored

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | EG <sub>y</sub>                                                                                                                                                                                                                                                                                                                                                    |
| Data unit                                                       | MWh (Mega-Watt hour)                                                                                                                                                                                                                                                                                                                                               |
| Description                                                     | Net electricity supplied to the grid by the Project                                                                                                                                                                                                                                                                                                                |
| Source of data                                                  | Certification of metering records and share certificate for electricity produced by wind farm provided by GEDA (Gujarat Energy Development Agency).                                                                                                                                                                                                                |
| Description of measurement methods and procedures to be applied | Net electricity supplied to grid by project activity is calculated by GEDA officials after apportioning transmission loss between individual meter installed at project site & sub-station meter. Transmission loss is determined by the state utility unilaterally on the basis of bulk meter readings measured directly and is applied in the GEDA certificates. |
| Frequency of monitoring/recording                               | Monthly: The reading is jointly noted by the representatives of Electricity Board officials and WWIL.                                                                                                                                                                                                                                                              |

|                                |                                                                                                                                                     |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|                                | The value of EGy for the project activity is also provided in the GEDA certificates and is applied directly for calculation of emission reductions. |
| Value monitored:               | 64413.903 MWh                                                                                                                                       |
| Monitoring equipment           | All the meters are two way tri-vector meter. Please refer section 3.3 for meter details.                                                            |
| QA/QC procedures to be applied | QA/QC procedures are implemented by state utility pursuant to the provisions of the power purchase agreement.                                       |
| Purpose of the data            | Calculation of baseline emissions                                                                                                                   |
| Calculation method             | Data is sourced from GEDA certificates. PP does not do any calculation of apportioning.                                                             |
| Comments                       | None                                                                                                                                                |

### 3.3 Monitoring Plan

#### Monitoring System of Project activity:

A detailed line diagram of project activity is shown in below picture. From the below picture it is clear that project activity (59.4 MW) has been installed at two locations. At one location there are 71 WEGs connected to 33kV individual metering point and other location has 04 WEGs connected to 11kV individual metering point at project site. Project activities along with the WEGs of other customers are connected to 33kV and 11kV feeder line at respective WWIL Sub-stations (132kV Bhogat & 66kV Navadra sub-stations) as mentioned in picture. At both WWIL sub-stations output of feeder line is step up to 132kV & 66kV respectively using step up transformer. Output of transformer is connected to Bulk/Common metering point at WWIL sub-stations where billing is to be done by Electricity Board officials on monthly basis. From WWIL Sub-station electricity is supplied to Electricity Board sub-station from where electricity is supplied to Western electricity grid.

The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication are as per the Wheeling agreement with Gujarat Electricity Transmission Corporation Limited (GETCO). However, the procedures adopted for metering details vary with the EPC contractor. The paragraphs below present the procedure adopted by the respective EPC contractors:

**Metering:** Project activity has 33kV and 11kV individual metering point for individual customers installed at project site. In addition to 33kV and 11kV metering point there is bulk/common metering point installed at WWIL Sub-station (132kv-Bhogat Sub-station & 66kV-Navadra Sub-station) where metering is done for all the WEGs of project activity & non-project activity.

**Metering Equipment:** Metering equipment is an electronic trivector meter of accuracy class 0.5 required for the Project. The meter is installed and owned by GEDA. The metering equipment is maintained in accordance with electricity standards prevalent in Gujarat.

**Meter Test Checking:** The meter is tested for accuracy with reference to a portable standard meter. The portable standard meter is also owned by GEDA. The meter is deemed to be working satisfactorily if the errors are within specifications for meters of 0.5 accuracy classes. The consumption registered by the meter alone holds good for the purpose of metering electricity supplied to the grid as long as the error in the meter is within the permissible limits. During the meter test checking, The meter is found to be within permissible limits of error.

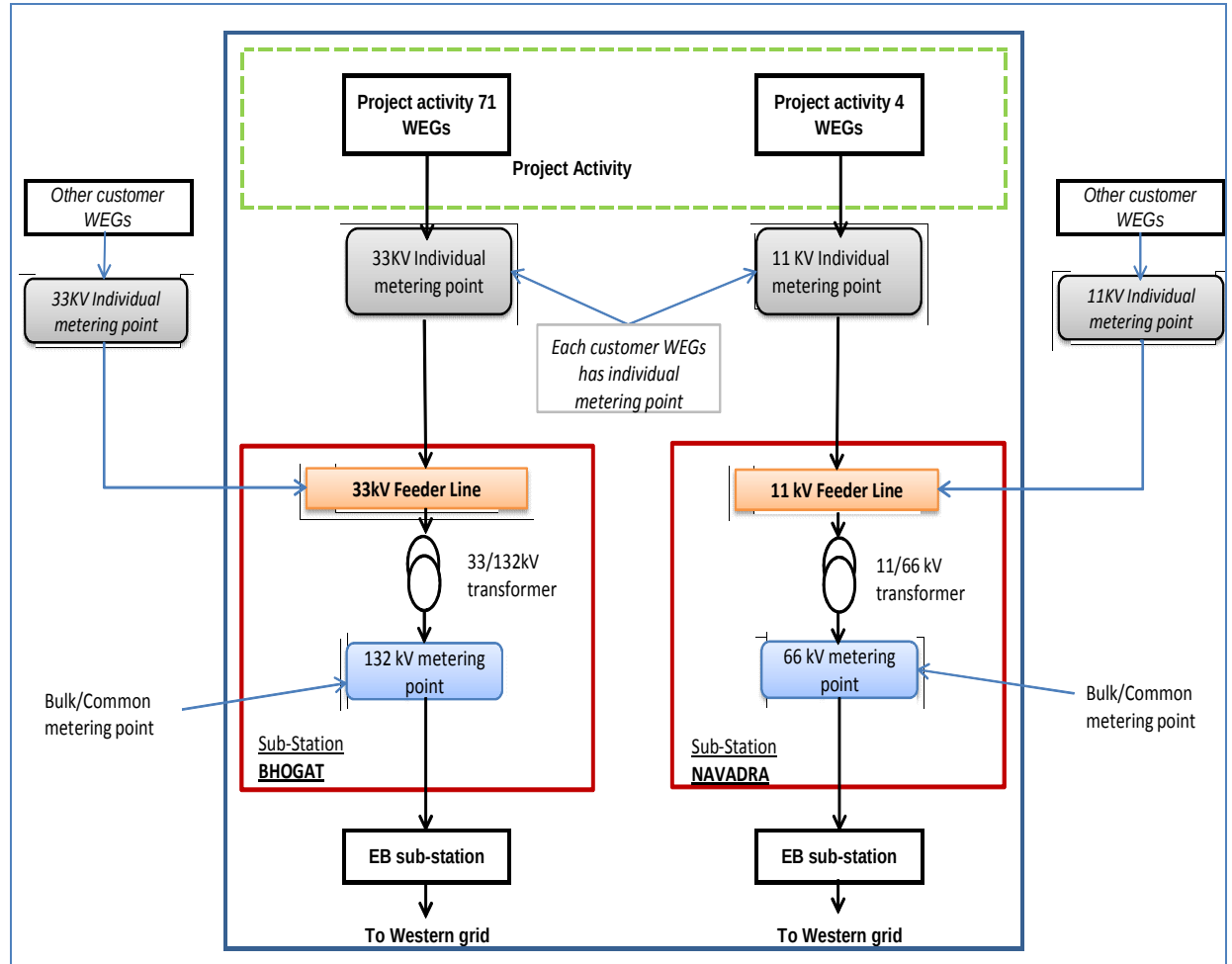


Figure: Line diagram of Project activity

**Monthly Meter Readings:** The Net electricity supplied to the grid is recorded monthly by taking a Joint Meter Reading (JMR) at individual metering point (33kV & 11kV at project site) along with the bulk/common metering point installed at WWIL Sub-station (132kV –Bhogat & 66kV-Navadra) in the presence of officials from GEDA and WWIL as O&M contractor, on behalf of project sponsor on the first day of every month at the Delivery Point. The Joint meter reading contains the value of energy imported and exported and the net export to the grid during the recording period. This Joint meter reading is certified by the Executive engineer of GEDA and by WWIL Officials. Based on the JMR reading recorded on monthly GEDA issues the share of electricity certificate mentioning the net electricity supplied to grid by individual customer.

**Calibration frequency:** As per registered VCS PD, the meter testing and checking procedures are solely within the purview of GETCO (Gujarat Energy Transmission Corporation Limited) and

are outside the purview of the monitoring plan for the projects. Since meter testing and checking procedures are solely within the purview of GETCO, all the meters at the project site and WWIL substation are calibrated and tested once in a period of three years. Meters installed at the project site are of accuracy class of 0.2%/ 0.5%; 3 out of 4 meters are of 0.5% accuracy class while 1 meter is of 0.2% accuracy class. Please refer below table for detailed information:-

Calibration details for all the meters are as follows:-

| Name of WWIL Substation | Meter Serial No | Accuracy Class | 2010        | 2013        |
|-------------------------|-----------------|----------------|-------------|-------------|
| Bhogat                  | GJB 00486       | 0.5%           | 23-Nov-2010 | 09-Dec-2013 |
|                         | GJU 07452       | 0.2%           | 23-Nov-2010 | 09-Dec-2013 |
| Navadra                 | GJB 00267       | 0.5%           | 29-May-2010 | 13-Dec-2013 |
|                         | GJB 00269       | 0.5%           | 29-May-2010 | 13-Dec-2013 |

From the table, it can be seen that there is a delay in calibration of meters. Therefore, while calculating the emission reduction for the project activity, CDM validation and verification standard, version 07.0, Point 9.4.4 ("Compliance with the calibration frequency requirements for measuring instruments"), paragraph 283 (a) has been applied. As per the VVS standard 07.0, error correction factor of - 0.5% has been applied on net export value as sourced by GEDA certificate during the month of Nov-2013 and Dec 2013.

For the WEGs connected at Bhogat sub-station, error correction factor is applied for the generation data of the months of November & December, 2013, while for Navadra sub-station, the error correction factor is applied for the generation data from May, 2013 to December, 2013.

**QA/QC Procedures:** Every month these meter readings are jointly recorded by GEDA representative and WWIL officials. The meters at the project site and WWIL substation are the two-way tri-vector meters and are in the custody of GEDA. QA/QC procedures will be as implemented by GEDA. Since the readings are taken at the point of supply of power to the grid, the transmission and distribution losses and the minimum reactive power consumption has already been taken into account. The meters at the substation are calibrated as per meter testing and checking procedures of GETCO to ensure accuracy of data as per the provision in PPA.

## 4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

### 4.1 Baseline Emissions

"The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO<sub>2</sub>e/kWh) calculated in a transparent and conservative manner as the weighted average emissions (in kg CO<sub>2</sub>e/kWh) as described in validated VCS PD.

$$BE_y = EG_y * EF_y$$

Where,

**BE** is baseline emissions in year y, tCO<sub>2</sub>e

**EG<sub>y</sub>** is the net electricity supplied to the grid in year y and is applied directly from JMR certified by state utility.

**EF<sub>y</sub>** is the CO<sub>2</sub> emission factor of the grid (940.22 tCO<sub>2</sub>e/GWh fixed ex-ante).

Accordingly:

Emission reduction (ER) calculation for the period 01-May-2013 to 31-December- 2013 (including first and last day):

$$\begin{aligned} BE_y &= 64413.903 \text{ (MWh)} * 0.94022(\text{tCO}_2/\text{MWh}) \\ &= 60,563 \text{ tCO}_2\text{e} \end{aligned}$$

## 4.2 Project Emissions

Since the project activity is a renewable energy project which generates electricity using wind power and hence does not result in project emissions as per approved methodology ACM 0002, version 6.

## 4.3 Leakage

No leakage is considered from the project activity as per approved methodology ACM0002, version 6.

## 4.4 Net GHG Emission Reductions and Removals

The total emission reductions achieved during the monitoring period is 60,563 tCO<sub>2</sub>.

Total baseline emissions: 60,563 tCO<sub>2</sub>

Total project emissions: Zero

Total leakage: Zero

$$\text{Emission reductions } ER_y = BE_y - PE_y - LE_y$$

$$= 60,563 - 0 - 0$$

$$= 60,563 \text{ tCO}_2$$

Vintage-wise consolidated table of emission reduction is given below:-

| Year         | Baseline emissions or removals (tCO <sub>2</sub> e) | Project emissions or removals (tCO <sub>2</sub> e) | Leakage emissions (tCO <sub>2</sub> e) | Net GHG emission reductions or removals (tCO <sub>2</sub> e) |
|--------------|-----------------------------------------------------|----------------------------------------------------|----------------------------------------|--------------------------------------------------------------|
| 2013         | 60,563                                              | 0                                                  | 0                                      | 60,563                                                       |
| <b>Total</b> | 60,563                                              | 0                                                  | 0                                      | 60,563                                                       |

Note: The emission reductions as mentioned in the above table are for the current monitoring period which covers the period from 1<sup>st</sup> May 2013 to 31<sup>st</sup> December 2013.

Total Emission Reductions for the monitoring period are **60,563 tCO<sub>2</sub>e**. The details of the net electricity generated (EG<sub>y</sub>), baseline emissions, project emissions, leakage and emission reductions on account of the project activity is provided in ER calculation sheet.

## APPENDIX 1: COMBINED MARGIN CALCULATIONS

The Operating Margin data for the most recent three years and the Build Margin data for the Western Region Electricity Grid as published in the CEA database (Version 1.1) are as follows:

### Simple Operating Margin

|                                              |                                 |
|----------------------------------------------|---------------------------------|
| Simple Operating Margin – 2002-03            | 981.41 tCO <sub>2</sub> e/GWh   |
| Simple Operating Margin – 2003-04            | 990.31 tCO <sub>2</sub> e/GWh   |
| Simple Operating Margin – 2004-05            | 1,011.94 tCO <sub>2</sub> e/GWh |
| Average Operating Margin of last three years | 994.55 tCO <sub>2</sub> e/GWh   |

### Build Margin

|                       |                               |
|-----------------------|-------------------------------|
| Build Margin- 2004-05 | 777.22 tCO <sub>2</sub> e/GWh |
|-----------------------|-------------------------------|

### Combined Margin calculations

|                  |      |                                    |
|------------------|------|------------------------------------|
| Operating Margin | 0.75 | 994.55 tCO <sub>2</sub> e/GWh      |
| Build Margin     | 0.25 | 777.22 tCO <sub>2</sub> e/GWh      |
| Combined Margin  |      | <b>940.22 tCO<sub>2</sub>e/GWh</b> |

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at [www.cea.nic.in](http://www.cea.nic.in)

## APPENDIX 2: LATITUDE & LONGITUDE DETAILS

| S. No. | Name of Customer          | M/C Model | Type of M/C | No. of M/C | Capacity (MW) | Site    | District | Loc. No.   | Latitude (Degree, Min., Sec.) | Longitude (Degree, Min., Sec.) |
|--------|---------------------------|-----------|-------------|------------|---------------|---------|----------|------------|-------------------------------|--------------------------------|
| 1      | Ahmedabad Strips P. Ltd.  | E-48      | 0.8         | 1          | 0.80          | Kurunga | Jamnagar | ASPLKRG-01 | N22 00 41.0                   | E69 10 13.3                    |
| 2      | Austin Engineering Co Ltd | E-48      | 0.8         | 1          | 0.80          | Kurunga | Jamnagar | AECLKRG-01 | N22 00 22.5                   | E69 10 45.6                    |
| 3      | Bhavani Industries        | E-48      | 0.8         | 1          | 0.80          | Navadra | Jamnagar | BINA-01    | N21 56 19.2                   | E69 17 00.7                    |
| 4      | Desai Textiles            | E-40      | 0.6         | 1          | 0.60          | Navadra | Jamnagar | DTPL-01    | N21 56 28.2                   | E69 14 21.4                    |
| 5      | Dinesh Mills              | E-48      | 0.8         | 5          | 4.00          | Bamnasa | Jamnagar | SDMLBM-01  | N22 05 52.6                   | E69 12 55.3                    |
|        |                           |           |             |            |               |         |          | SDMLBM-02  | N22 05 38.9                   | E69 12 54.7                    |
|        |                           |           |             |            |               |         |          | SDMLBM-03  | N22 05 34.5                   | E69 12 54.2                    |
|        |                           |           |             |            |               |         |          | SDMLBM-04  | N22 05 29.8                   | E69 12 54.6                    |
|        |                           |           |             |            |               |         |          | SDMLBM-05  | N22 05 25.2                   | E69 12 55.8                    |
| 6      | Eagle Fibers P. Ltd.      | E-48      | 0.8         | 1          | 0.80          | Kurunga | Jamnagar | EFPLKRG-01 | N22 00 44.5                   | E69 10 21.1                    |
| 7      | Echjay Industries Pvt Ltd | E-48      | 0.8         | 6          | 4.8           | Satapar | Jamnagar | EIPLSP-01  | N21 58 31.1                   | E69 18 24.5                    |
|        |                           |           |             |            |               |         |          | EIPLSP-02  | N21 58 26.3                   | E69 18 25.3                    |
|        |                           |           |             |            |               |         |          | EIPLSP-03  | N21 58 21.7                   | E69 18 28.0                    |
|        |                           |           |             |            |               |         |          | EIPLSP-04  | N21 58 16.9                   | E69 18 29.4                    |
|        |                           |           |             |            |               |         |          | EIPLSP-05  | N21 58 12.2                   | E69 18 30.1                    |
|        |                           |           |             |            |               |         |          | EIPLSP-06  | N21 58 07.5                   | E69 18 31.0                    |
| 8      | Empilon Fabrics P. Ltd.   | E-48      | 0.8         | 1          | 0.80          | Navadra | Jamnagar | EFPLNA-01  | N21 56 56.9                   | E69 16 58.1                    |
| 9      | Excel Crop Care Limited   | E-48      | 0.8         | 1          | 0.80          | Navadra | Jamnagar | ECCLNA-01  | N21 56 50.6                   | E69 16 36.9                    |
| 10     | Gujarat Guardian Ltd.     | E-48      | 0.8         | 14         | 11.20         | Bamnasa | Jamnagar | GGLBM-01   | N22 05 47.4                   | E69 13 12.1                    |
|        |                           |           |             |            |               |         |          | GGLBM-02   | N22 05 42.7                   | E69 13 12.4                    |
|        |                           |           |             |            |               |         |          | GGLBM-03   | N22 05 37.7                   | E69 13 12.7                    |
|        |                           |           |             |            |               |         |          | GGLBM-04   | N22 05 32.9                   | E69 13 13.0                    |
|        |                           |           |             |            |               |         |          | GGLBM-05   | N22 05 27.9                   | E69 13 12.3                    |
|        |                           |           |             |            |               |         |          | GGLBM-06   | N22 05 23.3                   | E69 13 13.0                    |
|        |                           |           |             |            |               |         |          | GGLBM-07   | N22 05 18.1                   | E69 13 13.3                    |
|        |                           |           |             |            |               |         |          | GGLBM-08   | N22 05 13.0                   | E69 13 13.7                    |
|        |                           |           |             |            |               |         |          | GGLBM-09   | N22 05 08.2                   | E69 13 13.2                    |
|        |                           |           |             |            |               |         |          | GGLBM-10   | N22 05 03.1                   | E69 13 12.8                    |

|    |                              |      |     |   |      |         |          |            |             |             |
|----|------------------------------|------|-----|---|------|---------|----------|------------|-------------|-------------|
|    |                              |      |     |   |      |         |          | GGLBM-11   | N22 04 59.0 | E69 13 15.7 |
|    |                              |      |     |   |      |         |          | GGLBM-12   | N22 04 53.8 | E69 13 13.4 |
|    |                              |      |     |   |      |         |          | GGLBM-13   | N22 04 49.3 | E69 13 08.7 |
|    |                              |      |     |   |      |         |          | GGLBM-14   | N22 05 55.3 | E69 13 08.0 |
|    | Gujarat Guardian Ltd.        | E-48 | 0.8 | 7 | 5.6  | Kurunga | Jamnagar | GGLKRG-01  | N22 02 25.5 | E69 09 58.8 |
|    |                              |      |     |   |      |         |          | GGLKRG-02  | N22 02 19.7 | E69 10 04.9 |
|    |                              |      |     |   |      |         |          | GGLKRG-03  | N22 02 14.0 | E69 10 11.1 |
|    |                              |      |     |   |      |         |          | GGLKRG-04  | N22 02 19.2 | E69 10 22.8 |
|    |                              |      |     |   |      |         |          | GGLKRG-05  | N22 02 30.7 | E69 10 10.5 |
|    |                              |      |     |   |      |         |          | GGLKRG-06  | N22 02 36.4 | E69 10 04.4 |
|    |                              |      |     |   |      |         |          | GGLKRG-07  | N22 02 51.6 | E69 10 10.4 |
|    | Gujarat Guardian Ltd.        | E-48 | 0.8 | 5 | 4    | Satapar | Jamnagar | GGLSP-01   | N21 58 01.2 | E69 18 52.5 |
|    |                              |      |     |   |      |         |          | GGLSP-02   | N21 58 05.6 | E69 18 51.5 |
|    |                              |      |     |   |      |         |          | GGLSP-03   | N21 58 10.7 | E69 18 52.4 |
|    |                              |      |     |   |      |         |          | GGLSP-04   | N21 58 17.6 | E69 18 52.7 |
|    |                              |      |     |   |      |         |          | GGLSP-08   | N21 58 35.8 | E69 18 22.1 |
|    | Gujarat Guardian Ltd.        | E-48 | 0.8 | 3 | 2.4  | Satapar | Jamnagar | GGLSP-05   | N21 58 20.5 | E69 18 49.3 |
|    |                              |      |     |   |      |         |          | GGLSP-06   | N21 58 45.2 | E69 18 18.8 |
|    |                              |      |     |   |      |         |          | GGLSP-07   | N21 58 40.5 | E69 18 20.4 |
| 11 | Indo Fashions Pvt. Ltd.*     | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | IFPLKRG-01 | N22 00 24.0 | E69 10 29.8 |
| 12 | Inova Cast Pvt Ltd           | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | ICPLKRG-01 | N22 00 16.7 | E69 10 51.7 |
| 13 | Jagdish Technocast Pvt. Ltd. | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | JTPLNA-01  | N21 56 15.6 | E69 16 42.7 |
| 14 | Jayant Agro-Organics Limited | E-48 | 0.8 | 2 | 1.60 | Navadra | Jamnagar | JAOLNA-01  | N21 57 06.4 | E69 16 52.1 |
|    |                              |      |     |   |      |         |          | JAOLNA-02  | N21 57 02.7 | E69 16 53.8 |
| 15 | Kanishka Prints P. Ltd.      | E-48 | 0.8 | 1 | 0.80 | Bamnasa | Jamnagar | KPPLBM-01  | N22 05 31.1 | E69 13 35.6 |
| 16 | Leamak Healthcare P. Ltd.    | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | LHPNA-01   | N21 56 49.7 | E69 17 00.3 |
| 17 | Madhusudan Special Solutions | E-48 | 0.8 | 1 | 0.80 | Satapar | Jamnagar | MSSPLSP-01 | N21 57 58.0 | E69 18 35.0 |
| 18 | Manish Packaging P. Ltd.     | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | MPPLKRG-01 | N22 02 30.7 | E69 09 53.2 |
| 19 | Mascot Forge Pvt. Ltd.       | E-48 | 0.8 | 1 | 0.80 | Satapar | Jamnagar | MFPLSP-01  | N21 58 55.0 | E69 18 10.3 |
| 20 | Nawaz Silk Mill              | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | NSMKRG-01  | N22 00 34.1 | E69 10 33.3 |
| 21 | Prabhat Elastomers P. Ltd.   | E-48 | 0.8 | 2 | 1.6  | Kurunga | Jamnagar | PEPLKRG-01 | N22 00 05.8 | E69 10 47.2 |
|    |                              |      |     |   |      |         |          | PEPLKRG-02 | N22 00 13.2 | E69 10 39.4 |
| 22 | Rachana Art Prints Pvt. Ltd. | E-48 | 0.8 | 1 | 0.80 | Bamnasa | Jamnagar | RACHNBM-01 | N22 05 26.9 | E69 13 38.4 |
| 23 | Rajhans Metals Pvt Ltd       | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | RMPLKG-01  | N22 00 40.6 | E69 10 27.8 |

|    |                                   |      |     |           |             |           |          |            |             |             |
|----|-----------------------------------|------|-----|-----------|-------------|-----------|----------|------------|-------------|-------------|
| 24 | Rajshanti Metals Pvt Ltd          | E-48 | 0.8 | 1         | 0.80        | Navadra   | Jamnagar | RMPLNA-01  | N22 00 41.2 | E69 10 27.9 |
| 25 | Ravikan Ceramics Pvt. Ltd.        | E-48 | 0.8 | 1         | 0.80        | Navadra   | Jamnagar | RCPNA-01   | N21 56 25.4 | E69 16 57.1 |
| 26 | Rivaa Textiles Ltd                | E-40 | 0.6 | 2         | 1.20        | Navadra   | Jamnagar | RIVAA-01   | N21 56 40.0 | E69 14 30.2 |
|    |                                   |      |     |           |             |           |          | RIVAA-02   | N21 56 36.7 | E69 14 33.2 |
| 27 | Sayaji Iron & Engineering Co.     | E-48 | 0.8 | 1         | 0.80        | Satapar   | Jamnagar | SIECLSP-01 | N21 58 24.5 | E69 18 46.1 |
| 28 | Shilp Gravures Ltd.               | E-48 | 0.8 | 1         | 0.80        | Navadra   | Jamnagar | SGLNA-01   | N21 56 41.7 | E69 17 03.8 |
| 29 | Shree Sai Calnates India (P) Ltd. | E-48 | 0.8 | 1         | 0.80        | Navadra   | Jamnagar | SSCPLNA-01 | N21 56 22.2 | E69 16 41.0 |
| 30 | Shreeji Prints Pvt. Ltd.          | E-48 | 0.8 | 2         | 1.60        | Bamnasa   | Jamnagar | SHREEBM-01 | N22 05 36.2 | E69 13 37.9 |
|    |                                   |      |     |           |             |           |          | SHREEBM-02 | N22 05 40.6 | E69 13 45.1 |
| 31 | Surbhi Industries Ltd.            | E-48 | 0.8 | 1         | 0.80        | Kurunga   | Jamnagar | SILKRG-01  | N22 00 17.9 | E69 10 34.5 |
| 32 | Transmetal Limited                | E-48 | 0.8 | 1         | 0.80        | Navadra   | Jamnagar | TLNA-01    | N21 56 44.1 | E69 16 34.3 |
| 33 | Unique Tags Private Limited       | E-48 | 0.8 | 1         | 0.80        | Navadra   | Jamnagar | UTPLNA-01  | N21 56 38.3 | E69 16 23.2 |
| 34 | Zydex Industries                  | E-48 | 0.8 | 1         | 0.80        | Satapar   | Jamnagar | DEXSP-01   | N21 59 01.0 | E69 18 12.6 |
|    | <b>Total capacity</b>             |      |     | <b>75</b> | <b>59.4</b> | <b>MW</b> |          |            |             |             |

**\*Indo Fashions Pvt Ltd. amalgamated with Surbhi Textile Mills Pvt Ltd, Surat w.e.f. August,2010.**

## APPENDIX 3: COMMISSIONING DETAILS

| <u>S. No.</u> | <u>Name of Customer</u>   | <u>M/C Model</u> | <u>Type of M/C</u> | <u>No. of M/C</u> | <u>Capacity (MW)</u> | <u>Site</u> | <u>District</u> | <u>Date of Commissioning</u> |
|---------------|---------------------------|------------------|--------------------|-------------------|----------------------|-------------|-----------------|------------------------------|
| 1             | Ahmedabad Strips P. Ltd.  | E-48             | 0.8                | 1                 | 0.80                 | Kurunga     | Jamnagar        | 03/12/2005                   |
| 2             | Austin Engineering Co Ltd | E-48             | 0.8                | 1                 | 0.80                 | Kurunga     | Jamnagar        | 23/12/2005                   |
| 3             | Bhavani Industries        | E-48             | 0.8                | 1                 | 0.80                 | Navadra     | Jamnagar        | 07/03/2006                   |
| 4             | Desai Textiles            | E-40             | 0.6                | 1                 | 0.60                 | Navadra     | Jamnagar        | 30/06/2004                   |
| 5             | Dinesh Mills              | E-48             | 0.8                | 5                 | 4.00                 | Bamnasa     | Jamnagar        | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
| 6             | Eagle Fibers P. Ltd.      | E-48             | 0.8                | 1                 | 0.80                 | Kurunga     | Jamnagar        | 04/02/2006                   |
| 7             | Echjay Industries Pvt Ltd | E-48             | 0.8                | 6                 | 4.8                  | Satapar     | Jamnagar        | 12/09/2006                   |
|               |                           |                  |                    |                   |                      |             |                 | 12/09/2006                   |
|               |                           |                  |                    |                   |                      |             |                 | 12/09/2006                   |
|               |                           |                  |                    |                   |                      |             |                 | 12/09/2006                   |
|               |                           |                  |                    |                   |                      |             |                 | 12/09/2006                   |
|               |                           |                  |                    |                   |                      |             |                 | 29/09/2006                   |
| 8             | Empilon Fabrics P. Ltd.   | E-48             | 0.8                | 1                 | 0.80                 | Navadra     | Jamnagar        | 07/03/2006                   |
| 9             | Excel Crop Care Limited   | E-48             | 0.8                | 1                 | 0.80                 | Navadra     | Jamnagar        | 07/03/2006                   |
| 10            | Gujarat Guardian Ltd.     | E-48             | 0.8                | 14                | 11.20                | Bamnasa     | Jamnagar        | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 16/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 29/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 29/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 30/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 31/03/2005                   |
|               |                           |                  |                    |                   |                      |             |                 | 31/03/2005                   |

|    |                              |      |     |   |      |         |          |            |
|----|------------------------------|------|-----|---|------|---------|----------|------------|
|    |                              |      |     |   |      |         |          | 31/03/2005 |
|    |                              |      |     |   |      |         |          | 30/03/2005 |
|    |                              |      |     |   |      |         |          | 16/07/2005 |
|    | Gujarat Guardian Ltd.        | E-48 | 0.8 | 7 | 5.6  | Kurunga | Jamnagar | 23/08/2006 |
|    |                              |      |     |   |      |         |          | 23/08/2006 |
|    |                              |      |     |   |      |         |          | 23/08/2006 |
|    |                              |      |     |   |      |         |          | 23/08/2006 |
|    |                              |      |     |   |      |         |          | 23/08/2006 |
|    |                              |      |     |   |      |         |          | 23/08/2006 |
|    |                              |      |     |   |      |         |          | 23/08/2006 |
|    | Gujarat Guardian Ltd.        | E-48 | 0.8 | 5 | 4    | Satapar | Jamnagar | 05/09/2006 |
|    |                              |      |     |   |      |         |          | 05/09/2006 |
|    |                              |      |     |   |      |         |          | 05/09/2006 |
|    |                              |      |     |   |      |         |          | 05/09/2006 |
|    | Gujarat Guardian Ltd.        | E-48 | 0.8 | 3 | 2.4  | Satapar | Jamnagar | 29/09/2006 |
|    |                              |      |     |   |      |         |          | 29/09/2006 |
|    |                              |      |     |   |      |         |          | 29/09/2006 |
| 11 | Indo Fashions Pvt. Ltd.*     | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | 15/12/2005 |
| 12 | Inova Cast Pvt Ltd           | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | 23/12/2005 |
| 13 | Jagdish Technocast Pvt. Ltd. | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | 07/03/2006 |
| 14 | Jayant Agro-Organics Limited | E-48 | 0.8 | 2 | 1.60 | Navadra | Jamnagar | 07/03/2006 |
| 15 | Kanishka Prints P. Ltd.      | E-48 | 0.8 | 1 | 0.80 | Bamnasa | Jamnagar | 17/08/2005 |
| 16 | Leamak Healthcare P. Ltd.    | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | 07/03/2006 |
| 17 | Madhusudan Special Solutions | E-48 | 0.8 | 1 | 0.80 | Satapar | Jamnagar | 30/09/2006 |
| 18 | Manish Packaging P. Ltd.     | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | 23/03/2006 |
| 19 | Mascot Forge Pvt. Ltd.       | E-48 | 0.8 | 1 | 0.80 | Satapar | Jamnagar | 22/09/2006 |
| 20 | Nawaz Silk Mill              | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | 15/12/2005 |
| 21 | Prabhat Elastomers P. Ltd.   | E-48 | 0.8 | 2 | 1.6  | Kurunga | Jamnagar | 17/11/2005 |
| 22 | Rachana Art Prints Pvt. Ltd. | E-48 | 0.8 | 1 | 0.80 | Bamnasa | Jamnagar | 17/08/2005 |
| 23 | Rajhans Metals Pvt Ltd       | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | 23/12/2005 |
| 24 | Rajshanti Metals Pvt Ltd     | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | 19/11/2005 |
| 25 | Ravikan Ceramics Pvt. Ltd.   | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | 07/03/2006 |
| 26 | Rivaa Textiles Ltd           | E-40 | 0.6 | 2 | 1.20 | Navadra | Jamnagar | 20/08/2004 |

|    |                                   |      |     |   |      |         |          |            |
|----|-----------------------------------|------|-----|---|------|---------|----------|------------|
| 27 | Sayaji Iron & Engineering Co.     | E-48 | 0.8 | 1 | 0.80 | Satapar | Jamnagar | 05/09/2006 |
| 28 | Shilp Gravures Ltd.               | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | 07/03/2006 |
| 29 | Shree Sai Calnates India (P) Ltd. | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | 07/03/2006 |
| 30 | Shreeji Prints Pvt. Ltd.          | E-48 | 0.8 | 2 | 1.60 | Bamnasa | Jamnagar | 17/08/2005 |
| 31 | Surbhi Industries Ltd.            | E-48 | 0.8 | 1 | 0.80 | Kurunga | Jamnagar | 15/12/2005 |
| 32 | Transmetal Limited                | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | 07/03/2006 |
| 33 | Unique Tags Private Limited       | E-48 | 0.8 | 1 | 0.80 | Navadra | Jamnagar | 07/03/2006 |
| 34 | Zydex Industries                  | E-48 | 0.8 | 1 | 0.80 | Satapar | Jamnagar | 22/09/2006 |

**\*Indo Fashions Pvt Ltd. amalgamated with Surbhi Textile Mills Pvt Ltd, Surat w.e.f. August,2010.**