



**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006**

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	<ul style="list-style-type: none">•The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.•As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at http://cdm.unfccc.int/Reference/Documents.
03	22 December 2006	<ul style="list-style-type: none">•The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.



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SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Efficient power generation using gas engine technology in textile industry.

Version: 01

05/02/2007.

A.2. Description of the small-scale project activity:

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The project activity has been undertaken at Arvind Intex (AI) and Arvind Cotsyn (AC) spinning units of “The Arvind Mills” who manufacture thread yarns primary raw material for Denim, Shirting and Apparel fabric manufacturing. The project activity entails implementation of energy efficient measures at AI and AC by installing energy efficient gas engines that utilize natural gas (NG) for efficient power generation thereby substituting fossil fuel use with cleaner gaseous fuel (NG) use.

Thus the primary objective of the project activity is to use cleaner fuel in an efficient operating system and reduce GHG emissions.

The GHG abatement project activity is a voluntary initiative undertaken by AI and AC under Kyoto Protocol (Clean Development Mechanism – CDM). Under Kyoto protocol a CDM project activity is required to demonstrate its contribution to sustainable development through Social, Economic, Environment and Technology indicators. The project activity contribution towards each indicator above mentioned is explained briefly below in *sustainable development indicator* section

Social well being:

During the implementation of the measure additional workforce was employed on payroll, which resulted in income generation sources for lower most employee section of the society. This has spurred development in local populace and therefore proved socially friendly and promoted sustainable development.

Economical well being:

The project has opened up business opportunities for the clean fuel distributors, local industries and other ancillary businesses.



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Environmental well being:

The project activity generates power using cleaner fuel natural gas at a higher efficiency and thus reduces GHG emissions. The project activity substitutes coal fossil fuel and reduces SO₂ emissions and particulate emissions. Therefore, the project is an environmentally friendly initiative by project proponent.

Technological well being:

The project activities involve captive power generation using efficient gas engine technology. This helps primarily in generating reliable power by using cleaner fuel. The advantages of the Gas engines are summarized below to demonstrate technological well being:

- Complete combustion of the gaseous fuel.
- Energy efficient power generation.
- Environmentally friendly technology, implemented with local technological know-how.

Therefore, the project helps “Host Country” *India* to fulfill its goals of promoting sustainable development.

A.3. Project participants:

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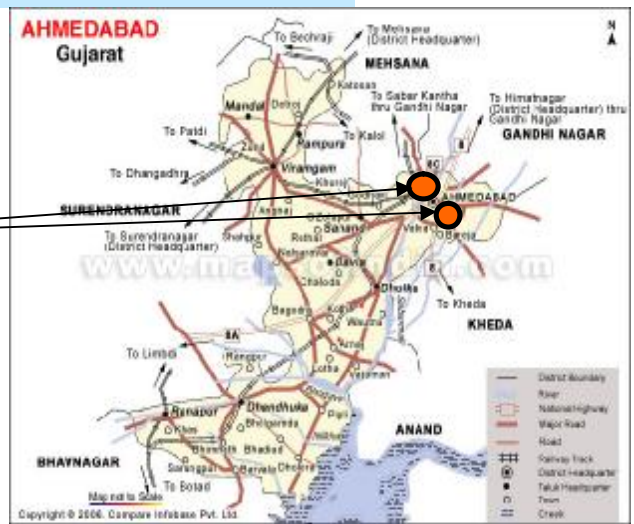
Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	Arvind Intex (AI) Ashoka Cotsyn (AC) (Private entities)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

>>
India



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A.4.1.2.	Region/State/Province etc.:
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Gujarat

A.4.1.3.	City/Town/Community etc:
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Ahmedabad

A.4.1.4.	Details of physical location, including information allowing the unique identification of this <u>small-scale project activity</u> :
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The small scale project activities are located in city of Ahmedabad, Gujarat. The project activity sites are easily approachable and accessible by road, railways and air transport. The geographical details are given below:

GEOGRAPHICAL LOCATION
of Arvind Intex and Ashoka Cotsyn

Longitude and Latitude	23.00 N, 72.40 E
Nearest Highway	5 Km from (National Highway-8)
Nearest Railway station	5 Km from (Ahmedabad) city
Nearest Airport	10 Km from (Ahmedabad) city

A.4.2. Type and category(ies) and technology/measure of the <u>small-scale project activity</u>:

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As per 'Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories', the project activity falls under

Main Category: Type II – *Energy Efficiency Improvement Projects*

Sub Category: “D” *Energy Efficiency and fuel switching measures for industrial facilities*

Version 08; Sectoral Scope 4; 23 December, 2006

Technology

AI and AC have installed 5.1 MW and 3.1 MW NG based engines. The Gas Engines operate on basis of 4 Stroke Cycle. In principle, mechanical energy is developed through the piston movement caused by combustion of a mixture of Natural Gas and air. The gas engine is coupled with alternator which in turn generates electrical energy.



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The power is further distributed through adequate distribution and switching network at individual project activity. Gas engines are operated on lean burn fuel technology for complete combustion. The lean gas air mixture is compressed in the engine cylinder, and some lean mixture enters the small pre-combustion chamber. The pre-chamber additionally has its own continuous gas supply from the main gas line. By this system the lean mixture from the cylinder is mixed with more gas to become fuel rich and easily ignited by the spark plug. This avoids detonation, increases the efficiency and reduces emissions.

Engine Technology specification:

Arvind Intex

Total Power generation - 5.1 MW

Engine Type – B35:40V12AG

Engine efficiency – 43.63 %

Ashoka Cotsyn

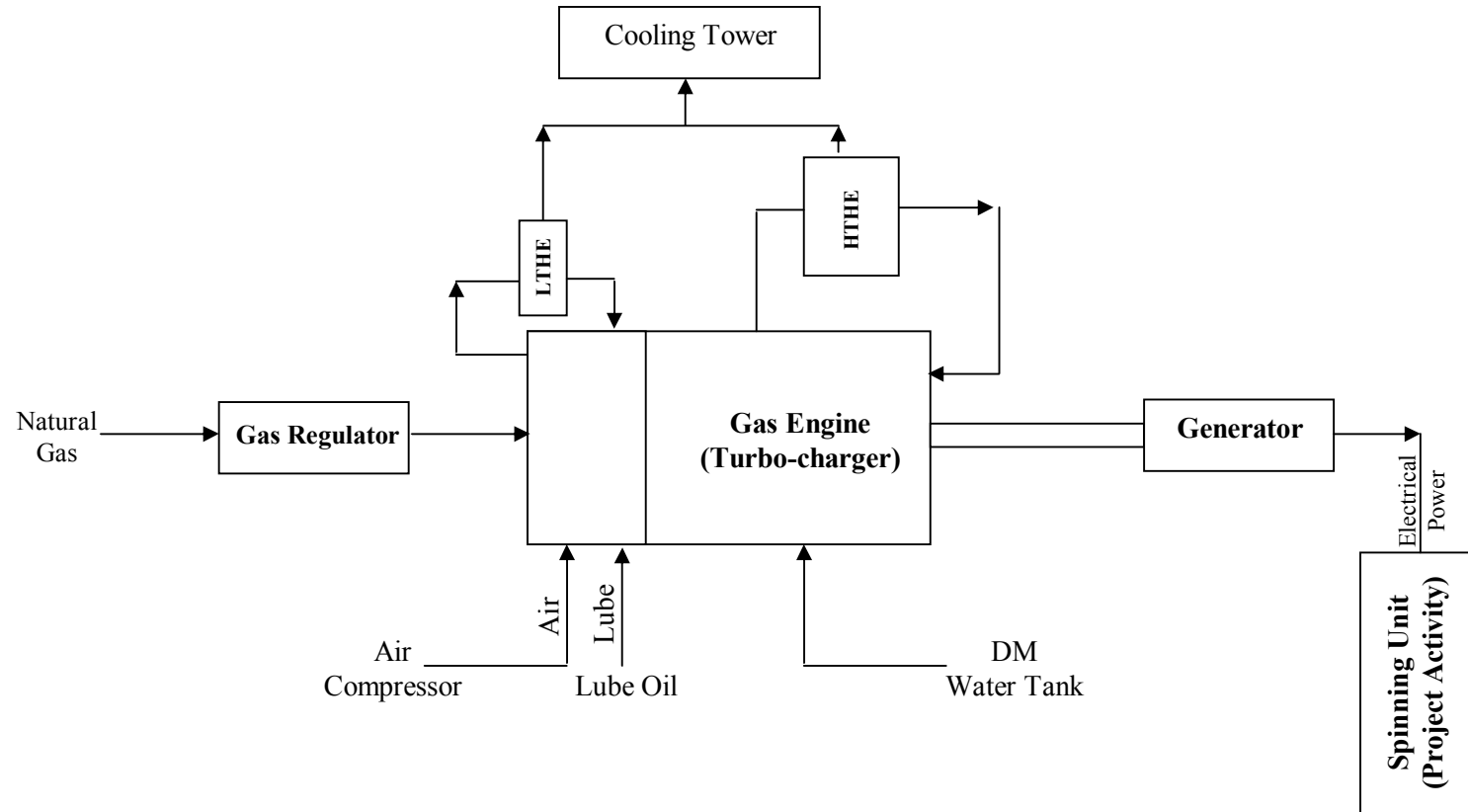
Total Power generation – 3.1 MW

Engine Type – KVGGS-18G1

Engine efficiency – 36.36%

Therefore the technology implemented is advance and proves to be environmentally safe. Process flow diagram of the technology implemented is presented in Fig.A.4.2.

Fig A.4.2: Process flow diagram of power generation using Natural Gas



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A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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Years	Annual estimation of emission reductions in (tonnes of CO ₂ e)	
	Arvind Intex (5.1 MW)	Ashoka Cotsyn (3.1 MW)
2008-09	34,210	18,977
2009-10	34,210	18,977
2010-11	34,210	18,977
2011-12	34,210	18,977
2012-13	34,210	18,977
2013-14	34,210	18,977
2014-15	34,210	18,977
2015-16	34,210	18,977
2016-17	34,210	18,977
2017-18	34,210	18,977
Total Estimated Reductions (tCO₂ e)	3,42,100	1,89,770
Total no of crediting period	10 years	10 years
Annual average over the crediting period of estimated reduction (tCO₂ e)	34,210	18,977

A.4.4. Public funding of the small-scale project activity:

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No public funding is available in this project activity from Annex 1, countries of UNFCCC.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

According to appendix C of simplified modalities and procedures for small-scale CDM project activities, ‘debundling’ is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities. The two small scale projects are being presented as one project activity. However they are not part of any other large project activity.

According to para 2 of appendix C¹

¹ Appendix C to the simplified M&P for the small-scale CDM project activities, <http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf>



A proposed small-scale project activity shall be deemed to be a de-bundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

1. With the same project participants;
2. In the same project category and technology/measure;
3. Registered within the previous 2 years; and
4. Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point

The project activity under discussion is the first climate change initiative developed under Clean Development Mechanism. There is no similar project technology implemented by the project proponent in the vicinity or within 1 km radius of the project boundary at AI and AC project activity sites. Therefore the project activity is not a de-bundled component of a large scale project activity and has been considered under the small scale category.



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SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

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Title: *II. – “Energy Efficiency Improvement Projects” D – “Energy Efficiency and fuel switch measures for industrial facilities”*

Reference: Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities, version 08, 23 December 2006.

B.2 Justification of the choice of the project category:

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As per the provisions of appendix B of simplified modalities and procedures for small scale CDM project activities AMS.II D “Comprises any energy efficiency and fuel switching measure implemented at a single industrial facility. This category covers project activities aimed primarily at energy efficiency;” “Examples include energy efficiency measures (such as efficient motors), fuel switching measures (such as switching from steam or compressed air to electricity) and efficiency measures for specific industrial processes (such as steel furnaces, paper drying, tobacco curing, etc.).”

The project activity measure implemented entails operating an NG based higher efficiency power generating system instead of a coal based lower efficiency system. Apart from the key applicability criteria stated above, the project activity is required to meet the following conditions in order to apply the baseline methodology:

Criteria 1: *The measure may replace, modify or retrofit existing facilities or be installed in a new facility.*

Justification 1: The project activity is new facility, which is installed in the AI and AC plant premises, thus meeting the applicability criteria.

Criteria 2: *The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh_e per year. A total saving of 60 GWh_e per year is equivalent to a maximal saving of 180 GWh_{th} per year in fuel input.*

Justification 2: The aggregate annual energy savings for the project activity amount to approximately 97.28 GWh_{thermal} which is below the 180GWh_{th} limit of small scale project activity of this category. The



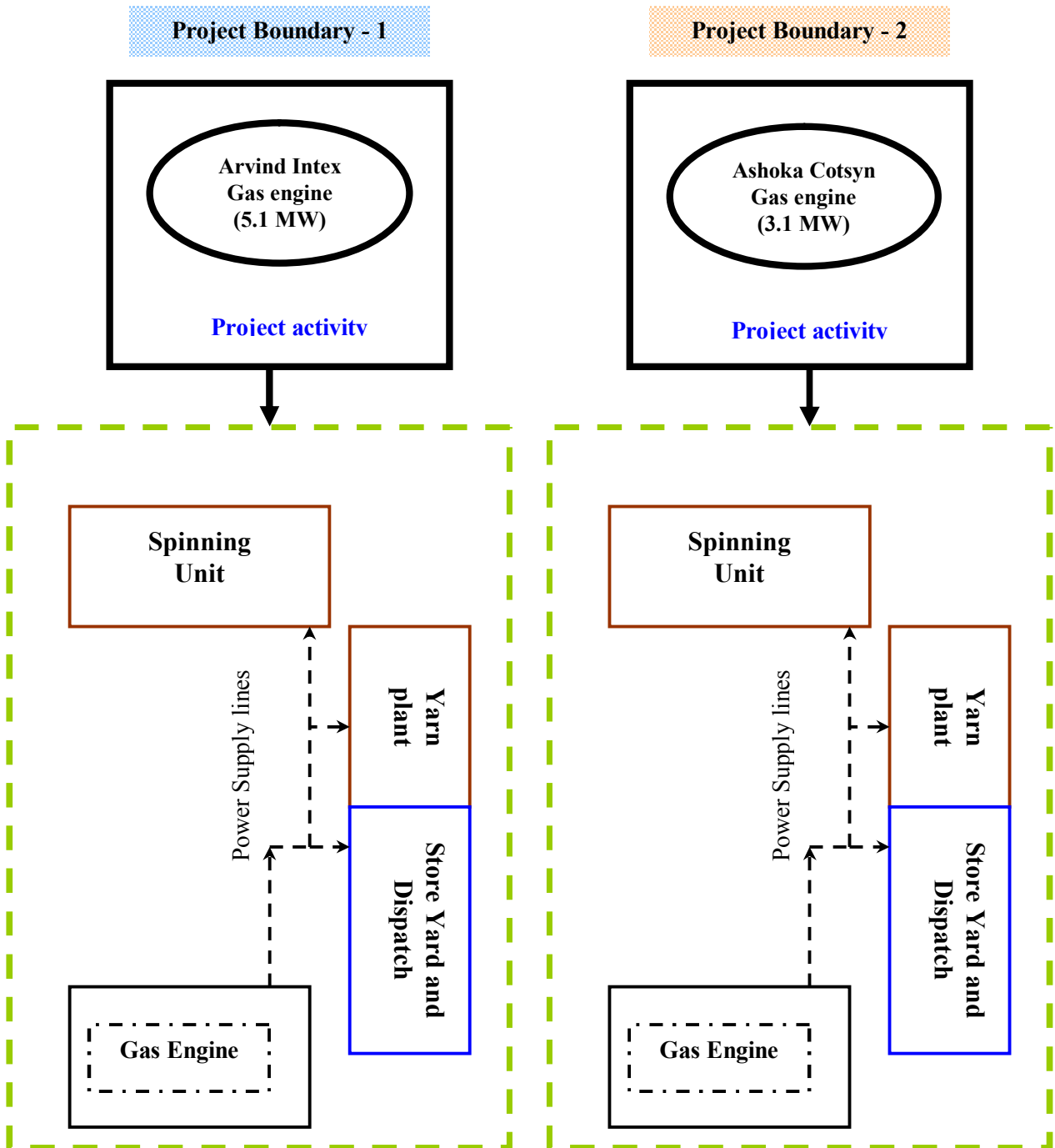
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project proponent will be within the small scale limit for the same production in future also and thus falls under the applicability criteria.

B.3. Description of the <u>project boundary</u>:

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As per AMS II.D small scale methodology, “The project boundary is the physical, geographical site of the industrial facility, processes or equipment that is affected by the project activity”. As per stated boundary definition the project boundary would consist of gas engine facilities at AI and AC.



**B.4. Description of baseline and its development:**

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The small scale methodology AMS.II.D/version 08, 23 December 2006 paragraph 3 and 4 state

“In the case of replacement, modification or retrofit measures, the baseline consists of the energy baseline of the existing facility or sub-system that is replaced, modified or retrofitted. *In the case of a new facility the energy baseline consists of the facility that would otherwise be built*”.

“Each energy form in the emission baseline is multiplied by an emission coefficient (in kg CO₂e/kWh). For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D. For fossil fuels, the IPCC default values for emission coefficients may be used”.

The baseline and its development have been carried out on the basis of criteria’s provided as per AMS II.D/version 08. The project proponent has identified plausible project options for baseline scenario, which include all possible courses of actions that could be adopted in order to generate power.

Further an assessment was conducted for each alternative to project activity with respect to the risks/barriers associated to implementation. The energy baseline was determined, which consists of the facility that would otherwise be built. The performance of the project activity and its associated emission reductions were evaluated with respect to the energy baseline scenario. Following are different alternatives which were assessed for determining baseline scenario at AI and AC:

Alternative 1- Power from specific power producer

In absence of CDM project activity, the AI and AC units could have drawn power from a specific power producer to meet its annual requirement. In this alternative, the power generated and wheeled would be from independent coal fired power plant producer with a plant efficiency of 33%. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline.

[Therefore the Alternative 1 is considered further for arriving at the baseline scenario.](#)

Alternative 2- Coal based Power generation

In absence of CDM project activity, the AI and AC units could draw power from captive coal fired power plant to meet its annual requirement. However the power generated efficiency would be again in the tune of 28 %. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline.

[Therefore the Alternative 2 is considered further for arriving at the baseline scenario.](#)

**Alternative 3- Natural Gas based Power generation**

In absence of CDM project activity, one of the plausible alternatives with the project proponent would be using cleaner NG fuel and generate power at higher efficiency to the tune of 35 to 45%. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline.

Therefore the Alternative 3 is considered further for arriving at the baseline scenario.

Alternative 4- Power generation using biomass

In absence of CDM project activity, the project activity could have generated power using renewable biomass to meet its power requirement. This alternative is in compliance with all applicable legal and regulatory requirements. However this alternative would not be a credible and realistic alternative available with the proponent as uncertainties in the biomass availability are extremely high.

Therefore the Alternative 4 may be excluded from further consideration.

Evaluation of the Alternatives based on their economic attractiveness and other critical considerations

The project proponent carried out a complete analysis among the credible and realistic alternatives (as mentioned above) based on the following key parameters:

- Power generation cost
- Other important considerations

in order to determine the baseline and additionality.

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Table B.3.1: Assessment of all the realistic and credible alternatives with AI and AC in absence of the project activity

Parameters	Alternative 1. Power from Specific power producer	Alternative 2 Coal based Power	Alternative 3 Natural Gas Engine based power
Power plant generation efficiency	33%	28%	Arvind Intex - 43.63 % Ashoka Cotsyn - 36.36%
Levelized Power generation cost	Very High (Rs.4.12 / kWh)	Low Arvind Intex (5.1MW) – Rs.2.73/kWh Ashoka Cotsyn (3.1 MW) – Rs.2.75/kWh	Medium Arvind Intex (5.1MW) – Rs.3.27/kWh Ashoka Cotsyn (3.1 MW) – Rs.3.76/kWh
Other Considerations	<ol style="list-style-type: none"> Scenario of heavy power shortages Scenario of heavy power cuts Production losses from uncertainty in power supply 	<ol style="list-style-type: none"> Coal is available in abundance and at a cheaper. Consistent power generation required for process requirement. 	<p>There are risks associated with ²</p> <ul style="list-style-type: none"> Availability of NG Unregulated Gas allocation Demand Supply gap Fluctuation in NG prices. <p>Availability and pricing is highly uncertain and dependent on domestic market which is still not well defined.</p> <p>The price trend assessment reveals that there is an upward trend in the pricing. Under these circumstances both AI and AC have taken a challenge to invest in the project activity and use NG to meet its power requirement.</p>

² <http://www.infraline.com/ong/default.asp?URL1=/ong/naturalgas/ngdefault.asp&idCategory=1236>

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<p>Conclusion</p>	<p>Not a baseline scenario</p>	<p>This alternative option is the Baseline Scenario</p>	<p>Hence without the CDM revenue, this alternative was not being a feasible option for AI and AC to adopt. Therefore <i>this alternative is additional since the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.</i></p>
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From the assessment of possible alternative we may state that Alternative 2 would have been our baseline scenario for power generation. In spite Alternative 2 being the most economic alternative, the project proponent has opted for power generation using efficient Gas engines. The project also substitutes fossil fuel with cleaner fuel NG, this help in reducing GHG emissions and promoting sustainable development. Section B.5 will describe the additionality and barrier faced in the project activity and towards its implementation.

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The project activity implemented will generate energy at higher efficiency and substitute fossil fuel with cleaner fuel NG. The emission coefficients and data required for estimation of baseline are provided in this section

Emission coefficient of fuel used in the baseline scenario

The fuel that would have been used in the baseline scenario Alternative 2 would have been coal whose emission coefficient as per the IPCC 1996 guidelines is 26.2 tC/ TJ and the Gross calorific value (GCV) of the same is 4,700 kcal/kg.

Emission coefficient of fuel used in the project activity

The fuel that will be used in the project scenario is the Natural gas, whose emission coefficient as per the IPCC 1996 guidelines is 15.3 tC/ TJ and the net calorific value (NCV) of the same is 8,350 kcal/SCM.

To estimate the baseline emissions, the quantity of coal that would have been used to generate power in the absence of the project activity would be determined based on the conservative plant efficiency of 28%. Whereas to estimate the project emissions in the project activity, to generate equivalent electricity has been determined based on plant efficiency of at 43.63% (AI) and 36.36% (AC). plant efficiency. Key information required establishing baseline in baseline and project scenario is given below:

Table 3.4: Representation of key information and data sources to establish the baseline scenario:

No	Key information and data used for baseline	Source of information/ data
Baseline		
1	Quantity of coal consumed	Calculated (Technology provider)
2	Gross Calorific Value (GCV) of coal	IPCC/National records
3	Emission Factor of coal	IPCC
4	Power units generated	Plant
6	Plant Efficiency	Technology provider
Project activity		
1	Quantity of NG consumed	Plant records
2	Net Calorific Value (NCV) of NG	Plant records
3	Emission Factor of NG	IPCC
4	Power units generated	Plant records
5	Auxiliary power consumption	Plant records
7	Plant Efficiency	Plant records /Third party report



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Date of completing the final draft of this baseline section:

05/02/2007

Name of person/entity determining the baseline:

Mr. Shirishchandra Saraiya
Chief Manager - Engineering
The Arvind Mills Ltd (AML).
P.O Khatraj, Tal. Kalol, District: Gandhinagar,
Pin-382 721, Gujarat, India
Tel: 91-2764-281100
Fax: 91-2764-281098
[email:shirishchandra.saraiya@arvindmills.com](mailto:shirishchandra.saraiya@arvindmills.com)

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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In accordance with paragraph 3, 4, 6 and 7 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology listed in Appendix B may be used for a small-scale CDM project activity if project participants are able to demonstrate to a designated operational entity that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in Attachment A of Appendix. B. These barriers are:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice
- Other barriers

However, the project proponent was aware of the various barriers associated to project implementation. But they realized that the availability of carbon financing against a sale consideration of carbon credits generated due to project activity would help to overcome these barriers. Some of the key barriers are discussed below:

Levelized cost comparison analysis

To justify that project activity is additional we have compared levelized power generation cost with specific power producer, coal based captive power generation and NG based captive power generation. A levelized cost analysis includes variable cost component and fixed cost components.

Source	Unit Cost (Rs/kWh)
Alternative 1: Power from Specific power producer	
Arvind Intex	4.12
Ashoka Cotsyn	
Alternative 2: Coal based Power	
Arvind Intex	2.73
Ashoka Cotsyn	2.75
Alternative 3: Natural Gas Engine based power	
Arvind Intex	3.27
Ashoka Cotsyn	3.76

The levelized cost analysis of the above alternatives, indicate that the energy generation cost in Alternative 3 is higher than Alternative 2. Even in this scenario AI and AC both have opted for advance technology at higher operating unit cost.

Investment Barrier

There is always an uncertainty in NG availability and price at which gas can be available. In-spite of this fact being a potential barrier to the project activities and which could result in non-operation and investment loss, the project proponent has gone ahead and implemented gas engine project.

Technology Barrier

Although NG gas turbine electricity generation is a well proven technology for power generation but the project proponent has gone one step ahead in the technological advancement. The project proponent has installed low NO_x engine which is not common feature in power generation for textile industry. This technological barrier was envisaged however the project proponent has implemented viewing its benefits to environment and sustainability.

The implementation of the project activity is a voluntary step undertaken by with no direct or indirect mandate by law.

The main driving force to this 'Climate change initiative' is:

- GHG reduction due to higher efficiency and cleaner fuel utilization
- the reduction in the fossil fuel quantities on account of better efficiencies.

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B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The procedure followed for estimating the emissions reductions from this project activity during the crediting period are as per the following steps which corresponds with AMS II.D / version 08, 23 December 2006.

Project Activities– Arvind Intex (AI) & Ashoka Cotsyn – (AC)

Steps	Description	Equation Used	Methodological Choices
1.	Procedure followed for calculation baseline emissions (BE,y)	<p>The simplified baseline emissions in the absence of the project activity are determined as per paragraph (4) of the applicable small scale methodology II.D / version 08, 23 December 2006.</p> <p>The energy baseline is determined on the basis of amount fossil fuel that would have been consumed times its emission factor for total power requirement per annum. The emission from the project activity are calculated with the help of equations 1, 2 & 3</p> $BaselineEmission = Q_{ff} \times NCV_{ff} \times EF_{ff} \times OX_{ff} \text{ -----1}$ <p>where,</p> <p>Q_{ff} Quantity of fossil fuel (coal) consumed in baseline in MT GCV_{ff} Gross calorific value of coal (kcal/kg) EF_{ff} Emission factor of coal in tC/TJ, which is 26.2 tC/tJ as given in the IPCC guidelines OX Oxidation factor of fossil fuel (coal), 0.98</p>	<p>The baseline emissions are calculated on the basis paragraph 3 & 4 of AMS II.D, which states</p> <ol style="list-style-type: none"> In the case of replacement, modification or retrofit measures, the baseline consists of the energy baseline of the existing facility or sub-system that is replaced, modified or retrofitted. In the case of new facility the energy baseline consists of the facility that would otherwise be built Each energy form in the emission baseline is multiplied by an emission co-efficient (in kg CO₂e/kWh). For the electricity displaced, the emission coefficient is calculated in accordance with provision under category I.D. For fossil fuels, the IPCC default values for emission coefficients may be used.

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1.	Contd...	$Q_{ff} = \frac{U_{ff} \times \eta_{ff}}{NCV_{ff}} \text{-----} 2$ <p>where,</p> <p>U_{ff} Gross Power Units supplied by fossil fuel (coal) fired power plants at AI and AC.</p> <p>η_{ng} Coal fired power plant generation efficiency at (28%) at AI and AC.</p> <p>Applying the appropriate values (Section B.6.2 and section B.7.1) the baseline emissions calculated are</p> <p>Arvind Intex (AI) – 5.1 MW – 51,799 tCO₂e</p> <p>Ashoka Cotsyn – 3.1 MW – 31,776 tCO₂e</p>	-
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<p>2.</p>	<p>Procedure followed for estimating emissions from project activity (PE,y)</p>	<p>As the project activity substitute’s fossil fuel with cleaner fuel (NG), the project activity emissions and calculated on the basis of NG consumed times its emission factor for a total power requirement per annum. The emission from the project activity are calculated with the help of equations 4, 5 & 6</p> $ProjectEmission = Q_{ng} \times NCV_{ng} \times EF_{ng} \times OX_{ng} \text{ --- 4}$ <p>where,</p> <p>Q_{ng} Quantity of natural gas (SCM) consumed by the project activity at Avind Intex (5.1 MW)– gas engine efficiency (η-43.63%) Ashoka Cotsyn (3.1 MW) – gas engine efficiency (η-36.36%)</p> <p>NCV_{ng} Net calorific value of natural gas (kcal/SCM)</p> <p>EF_{ng} Emission factor of natural gas in tC/TJ, which is 15.3 tC/tJ as given in the IPCC guidelines</p> <p>OX Oxidation factor of natural gas, 0.99</p> $Q_{ng} = \frac{U_{ng} \times \eta_{ng}}{NCV_{ng}} \text{ -----5}$ <p>where,</p> <p>U_{ng} Gross Power generated by gas engines located at AI and AC.</p> <p>η_{ng} NG based power plant generation efficiency at (43.63% and 36.36%) at AI and AC respectively.</p> <p>Applying the appropriate values (Section B.6.2 and section B.7.1) the project emissions calculated are:</p> <p>Arvind Intex (AI) – 5. 1 MW – 17,589 tCO₂e</p> <p>Ashoka Cotsyn – 3.1 MW – 12,789 tCO₂e</p>	<p>-</p>
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3.	Procedure followed for estimating leakage (L,y)	<p>Leakage as per stated criteria are not considered as there is no transfer of energy efficient from one activity to another \therefore Leakages = 0</p>	<p>As per AMS.II.D of indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity, paragraph 5 states “If the energy efficiency technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered. The project activity does not involve such type of equipment transfer activity; therefore “No leakage” is considered emission reduction calculation.</p>
4.	Procedure followed for calculating Emission Reductions (ER,y)	<p>The equation used to calculate emission reductions is $ER_{,y} = BE_{,y} - PE_{,y} - L_{,y}$ The project emissions are zero for the project. Therefore the emission reduction is calculated as per the give formula: $ER_{,y} = BE_{,y} - PE_{,y} - L_{,y}$ Where: ER,y Emission Reductions (tCO₂) BE,y Baseline emissions (tCO₂) PE,y Project emissions (tCO₂) L,y Leakage emissions (tCO₂) Emission reduction for the activity is: Arvind Intex (AI) – 5.1 MW – 34,210 tCO₂e Ashoka Cotsyn – 3.1 MW – 18,977 tCO₂e</p>	-

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B.6.2. Data and parameters that are available at validation:

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Baseline data and parameters for 5.1MW equivalent fossil fuel fired power plant

Data / Parameter:	$GCV_{\text{fossil fuel}}$
Data unit:	Kcal/kg
Description:	Gross calorific value of fossil fuel
Source of data used:	IPCC/National sources
Value applied:	4,700
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	$EF_{\text{fossil fuel}}$
Data unit:	tCO ₂ /TJ
Description:	Emission factor of fossil fuel
Source of data used:	1996 IPCC guidelines
Value applied:	26.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Most authentic and reliable third party data source.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	$\eta_{\text{fossil fuel}}$
Data unit:	%
Description:	Generation efficiency of fossil fuel power plant
Source of data used:	The data parameter is provided by the technology provider.
Value applied:	28
Justification of the choice of data or description of measurement methods and procedures actually applied :	Most authentic third party data source.

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Any comment:	Data will be kept for crediting period + 2 years.
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Project Activity data and parameters for 5.1MW Natural Gas fired engine plant

Data / Parameter:	NCV _{ng}
Data unit:	Kcal/SCM
Description:	Net calorific value of Natural gas
Source of data used:	NG transporters contract document
Value applied:	8,350
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	EF _{ng}
Data unit:	tCO ₂ /TJ
Description:	Emission factor of Natural gas
Source of data used:	1996 IPCC guidelines
Value applied:	15.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Most reliable third party data source.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	η _{ng}
Data unit:	%
Description:	Generation efficiency of Natural gas based power plant
Source of data used:	Plant
Value applied:	43.63
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Data will be kept for crediting period + 2 years.

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Baseline data and parameters for 3.1MW equivalent fossil fuel fired power plant

Data / Parameter:	$GCV_{\text{fossil fuel}}$
Data unit:	Kcal/kg
Description:	Gross calorific value of fossil fuel
Source of data used:	IPCC/National sources
Value applied:	4,700
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	$EF_{\text{fossil fuel}}$
Data unit:	tCO ₂ /TJ
Description:	Emission factor of fossil fuel
Source of data used:	1996 IPCC guidelines
Value applied:	26.2
Justification of the choice of data or description of measurement methods and procedures actually applied :	Most authentic and reliable third party data source.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	$\eta_{\text{fossil fuel}}$
Data unit:	%
Description:	Generation efficiency of fossil fuel power plant
Source of data used:	The data parameter is provided by the technology provider.
Value applied:	28
Justification of the choice of data or description of measurement methods and procedures actually applied :	Most authentic third party data source.
Any comment:	Data will be kept for crediting period + 2 years.

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Project Activity data and parameters for 3.1MW Natural gas fired engine plant

Data / Parameter:	NCV_{ng}
Data unit:	Kcal/SCM
Description:	Net calorific value of Natural gas
Source of data used:	NG transporters contract document
Value applied:	8,350
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	EF_{ng}
Data unit:	tCO ₂ /TJ
Description:	Emission factor of Natural gas
Source of data used:	1996 IPCC guidelines
Value applied:	15.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Most reliable third party data source.
Any comment:	Data will be kept for crediting period + 2 years.

Data / Parameter:	η_{ng}
Data unit:	%
Description:	Generation efficiency of Natural gas based power plant
Source of data used:	Plant
Value applied:	36.36
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	Data will be kept for crediting period + 2 years.

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B.6.3 Ex-ante calculation of emission reductions:

>>

Baseline Calculations: Arvind Intex (AI) – 5.1 MW

Baseline Emissions		
Description	Units	Calculations
Gross Power Generation from coal power plant per annum	MU	42.8
Efficiency of coal power plant	%	28.0
Gross Calorific value of coal	kcal/kg	4,700
Annual Total coal quantity required	MT	27,961
Energy Content	TJ	550.20739
Emission factor of coal	TC/TJ	26.20
	tCO ₂ /TJ	96.07
Oxidation factor	%	0.98
Annual baseline CO ₂ emissions	tCO ₂	51,799

Project Emission Calculations: Arvind Intex (AI) – 5.1 MW

Description	Units	Calculations
Gross Power Generation from NG engine plant per annum	MU	38.4
Efficiency of NG engine plant	%	43.63
Net Calorific value of NG	kcal/SCM	8,350
Annual NG required	SCM	9,058,954.28
Energy Content	TJ	316.69905
Emission factor of NG	TC/TJ	15.30

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	tCO ₂ /TJ	56.10
Oxidation factor	%	0.99
Annual project CO ₂ emissions	tCO ₂	17,589

Leakages:

LE = 0 tCO₂e

Emission Reduction Calculations:

Emission Reductions = 34,210 tCO₂ e

Baseline Calculations: Ashoka Cotsyn (AC) – 3.1 MW

Description	Units	Calculations
Gross Power Generation from coal power plant per annum	MU	26.2
Efficiency of coal power plant	%	28
Gross Calorific value of coal	kcal/kg	4,700
Annual Total coal quantity required	MT	17,152
Energy Content	TJ	339
Emission factor of coal	TC/TJ	26.20
	tCO ₂ /TJ	96.07
Oxidation factor	%	0.98
Annual baseline CO ₂ emissions	tCO ₂	31,776

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Project Emission Calculations: Ashoka Cotsyn (AC) – 3.1MW

Description	Units	Calculations
Gross Power Generation from NG engine plant per annum	MU	23.3
Efficiency of NG engine plant	%	36.36
Net Calorific value of NG	kcal/SCM	8,350
Annual NG required	SCM	6,591,532.66
Energy Content	TJ	230.43853
Emission factor of NG	TC/TJ	15.30
	tCO ₂ /TJ	56.10
Oxidation factor	%	0.99
Annual project CO ₂ emissions	tCO ₂	12,798

Leakages:LE = 0 tCO₂e**Emission Reduction Calculations:**Emission Reductions = 18,977 tCO₂ e

B.6.4 Summary of the ex-ante estimation of emission reductions:
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>>

Project Activity 1 - Arvind Intex

Year	Estimated Project Activity Emissions (tonnes of CO ₂ e)	Estimated Baseline Emissions (tonnes of CO ₂ e)	Estimated leakage(tonnes of CO ₂ e)	Estimated Emission Reduction (tonnes of CO ₂ e)
2007-08	17,589	51,799	0	34,210
2008-09	17,589	51,799	0	34,210
2009-10	17,589	51,799	0	34,210
2010-11	17,589	51,799	0	34,210
2011-12	17,589	51,799	0	34,210
2012-13	17,589	51,799	0	34,210
2013-14	17,589	51,799	0	34,210
2014-15	17,589	51,799	0	34,210
2015-16	17,589	51,799	0	34,210
2016-17	17,589	51,799	0	34,210
Total	1,75,890	5,17,990	0	3,42,100

Project Activity 2 - Ashoka Cotsyn

Year	Estimated Project Activity Emissions (tonnes of CO ₂ e)	Estimated Baseline Emissions (tonnes of CO ₂ e)	Estimated leakage(tonnes of CO ₂ e)	Estimated Emission Reduction (tonnes of CO ₂ e)
2007-08	12,798	31,766	0	18,977
2008-09	12,798	31,766	0	18,977
2009-10	12,798	31,766	0	18,977
2010-11	12,798	31,766	0	18,977
2011-12	12,798	31,766	0	18,977
2012-13	12,798	31,766	0	18,977
2013-14	12,798	31,766	0	18,977
2014-15	12,798	31,766	0	18,977
2015-16	12,798	31,766	0	18,977
2016-17	12,798	31,766	0	18,977
Total	1,27,980	3,17,660	0	1,89,770



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B.7 Application of a monitoring methodology and description of the monitoring plan:
B.7.1 Data and parameters monitored:
Project Activity data and parameters for 5.1 MW Natural Gas engine

Data / Parameter:	Q_{ng}
Data unit:	SCM
Description:	Annual quantity of natural gas consumed
Source of data to be used:	Plant
Value of data	9.058 MMSCM
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> Measurement with NG flow meter at the plant location (Transporters meter) <u>Data type:</u> Measured <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Shift In charge will co-ordinate with the gas Transporter for monitoring and checks for regular calibration of measuring instruments. <u>Calibration Frequency:</u> Once in two years.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	U_{ng}
Data unit:	MU
Description:	Gross power units generated by gas engine
Source of data to be used:	Plant
Value of data	38.4
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> Measurement to be done with energy meter at the plant location (Gas engine –HT room) <u>Data type:</u> Measured <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Shift In charge would be responsible for monitoring and checks for regular calibration of measuring instruments. <u>Calibration Frequency:</u> Once in five years.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	NCV_{ng}
Data unit:	Kcal/SCM
Description:	Net calorific value of Natural gas

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Source of data to be used:	Plant
Value of data	8,350
Description of measurement methods and procedures to be applied:	Monitoring: Data provided NG supplier (Contract Value) Data type: Measured Archiving procedure: Paper and Electronic Recording Frequency: Daily Responsibility: Shift In charge would be responsible for monitoring and checks. Calibration Frequency: Not applicable
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	EF_{ng}
Data unit:	tC/TJ
Description:	Emission Factor of Natural Gas
Source of data to be used:	1996 IPCC guidelines
Value of data	15.3
Description of measurement methods and procedures to be applied:	Monitoring: Not applicable Data type: Estimated Archiving procedure: Paper and Electronic Recording Frequency: Once in six months Responsibility: Shift In charge would be responsible for checking for regular update in IPCC emission factor as per IPCC guidelines. Calibration Frequency: Not applicable
QA/QC procedures to be applied:	As per Revised 1996 IPCC guidelines for National Greenhouse Gas Inventories: Workbook
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	η_{ng}
Data unit:	%
Description:	Generation efficiency of Natural gas based power plant
Source of data to be used:	Plant
Value of data	43.63
Description of measurement methods and procedures to be applied:	Monitoring: Actual and calculated based on efficiency formulae. Data type: Calculated Archiving procedure: Paper and Electronic Recording Frequency: Once in 15 days Responsibility: Shift In charge Calibration Frequency: Not applicable
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs



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Project Activity data and parameters for 3.1 MW Natural Gas engine

Data / Parameter:	Q_{ng}
Data unit:	SCM
Description:	Annual quantity of natural gas consumed
Source of data to be used:	Plant
Value of data	6.591 MMSCM
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> Measurement with NG flow meter at the plant location (Transporters meter) <u>Data type:</u> Measured <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Shift In charge will co-ordinate with the gas Transporter for monitoring and checks for regular calibration of measuring instruments. <u>Calibration Frequency:</u> Once in two years.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	U_{ng}
Data unit:	MU
Description:	Gross power units generated by gas engine
Source of data to be used:	Plant
Value of data	23.3
Description of measurement methods and procedures to be applied:	<u>Monitoring:</u> Measurement to be done with energy meter at the plant location (Gas engine –HT room) <u>Data type:</u> Measured <u>Archiving procedure:</u> Paper and Electronic <u>Recording Frequency:</u> Daily <u>Responsibility:</u> Shift In charge would be responsible for monitoring and checks for regular calibration of measuring instruments. <u>Calibration Frequency:</u> Once in five years.
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	NCV_{ng}
Data unit:	Kcal/SCM
Description:	Net calorific value of Natural gas
Source of data to be used:	Plant



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Value of data	8,350
Description of measurement methods and procedures to be applied:	<u>Monitoring: Data provided NG supplier (Contract Value)</u> <u>Data type: Measured</u> <u>Archiving procedure: Paper and Electronic</u> <u>Recording Frequency: Daily</u> <u>Responsibility: Shift In charge would be responsible for monitoring and checks.</u> <u>Calibration Frequency: Not applicable</u>
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	EF_{ng}
Data unit:	tC/TJ
Description:	Emission Factor of Natural Gas
Source of data to be used:	1996 IPCC guidelines
Value of data	15.3
Description of measurement methods and procedures to be applied:	<u>Monitoring: Not applicable</u> <u>Data type: Estimated</u> <u>Archiving procedure: Paper and Electronic</u> <u>Recording Frequency: Once in six months</u> <u>Responsibility: Shift In charge would be responsible for checking for regular update in IPCC emission factor as per IPCC guidelines.</u> <u>Calibration Frequency: Not applicable</u>
QA/QC procedures to be applied:	As per Revised 1996 IPCC guidelines for National Greenhouse Gas Inventories: Workbook
Any comment:	Data archived: Crediting period + 2 yrs

Data / Parameter:	η_{ng}
Data unit:	%
Description:	Generation efficiency of Natural gas based power plant
Source of data to be used:	Plant
Value of data	36.36
Description of measurement methods and procedures to be applied:	<u>Monitoring: Actual and calculated based on efficiency formulae.</u> <u>Data type: Calculated</u> <u>Archiving procedure: Paper and Electronic</u> <u>Recording Frequency: Once in 15 days</u> <u>Responsibility: Shift In charge</u> <u>Calibration Frequency: Not applicable</u>
QA/QC procedures to be applied:	Yes, Quality Management System will be used and the same procedures would be available at the project site

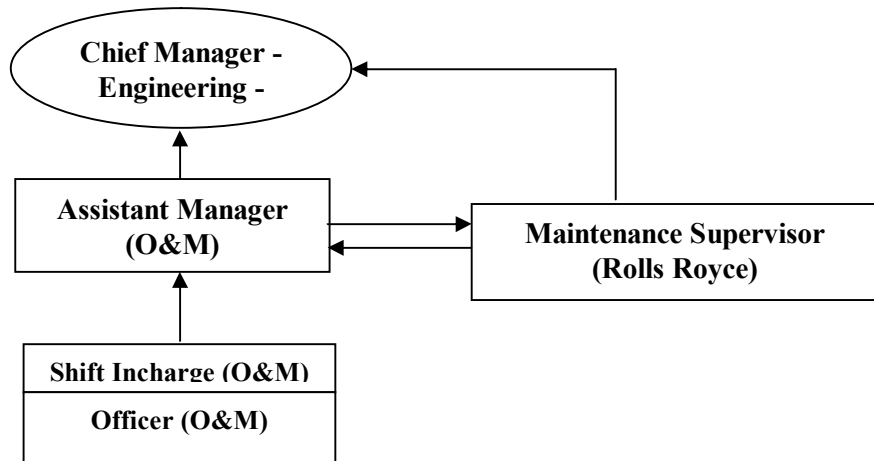


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Any comment:	Data archived: Crediting period + 2 yrs
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B.7.2 Description of the monitoring plan:
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**Roles and Responsibilities:****Chief Manager - Engineering:**

1. Ensuring implementation of monitoring procedures lay down for monitoring.
2. Internal audits and project conformance reviews.
3. Organizing and conducting training program on CDM and related activities for staff.
4. Implementing all monitoring control procedures
5. Associating with maintenance engineer towards O&M of NG engine and related measurement instruments
6. Reviewing records and monitored data.
7. Overall responsibility for correcting NOC and implementing corrective actions before verification.

Assistant Manager (O&M):

1. To discuss and sort out matter related to engine and connected system with Chief Manager-Engg.
2. Checks data logged by the officer
3. Interacts with Shift In-charge engineers (O&M) for smooth operation of Gas engine.
4. Maintain calculations, record handling and monitored data verification.

Shift In –Charge (O&M)

1. To monitor and ensure smooth operation of gas engine generator and connected system as per the guide lines provided by Assistant Manager (O & M)
2. To follow the routine and schedule maintenance under the supervision of Rolls Royce Residence Engineer. To check data logged by the engine officer (O &M)
3. All shifts records to be forwarded to Assistant Manager (O & M) for further processing.



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Officer (O&M)

Officer will collect data and report to the Shift in-charge for further processing.

Site Engineer In-charge (RRESIPL)³:

Maintenance manager will look primarily in operation and maintenance cycle of the NG engine.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Date of completing the final draft of this baseline and monitoring methodology:

22/12/2006

Name of person/entity determining the baseline:

Project Activity - Arvind Intex (5.1 MW)

Mr. Chaitanya Thaker

Chief Manager - Engineering

Rajpur Road, Gomtipur,

Ahmedabad, Pin-380 021, Gujarat, India

Tel: 91-079 - 22167125

Fax: 91-079 - 22138128

E-mail: chaitanya.thaker@arvindmills.com

website: www.arvindmills.com

Project Activity – Ashoka Cotsyn (3.1 MW)

Mr. Jayraj Kansodaria

Chief Manager – Engineering

Khokhra Mehmdabad, Ahmedabad,

Pin-380 008, Gujarat, India

Tel: 91-079 -22770514

Fax: 91-079 - 22771230

E-mail: jayraj.kansodaria@arvindmills.com

website: www.arvindmills.com

³ RRESIPL: Rolls Royce Energy Systems India Private Ltd- Operation supervision and Maintenance agreement



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SECTION C. Duration of the project activity / crediting period
C.1. Duration of the small-scale project activity:

>>

10 years and 0 months

C.1.1. Starting date of the small-scale project activity:

>>

Project activity 1 – Arvind Intex (5.1 MW)

23/09/2004

Project activity 2 – Ashoka Cotsyn (3.1 MW)

23/09/2004

C.1.2. Expected operational lifetime of the small-scale project activity:

>>

Project activity 1 – Arvind Intex (5.1 MW)

25 years

Project activity 2 – Ashoka Cotsyn (3.1 MW)

25 years

C.2. Choice of crediting period and related information:

>>

C.2.1. Renewable crediting period:

>>

Not applicable

C.2.1.1. Starting date of the first crediting period:

>>

Not applicable

C.2.1.2. Length of the first crediting period:

>>

Not applicable

C.2.2. Fixed crediting period:

>>

10 years and 0 months

C.2.2.1. Starting date:

>>

Project activity 1 – Arvind Intex (5.1 MW) :30/07/2007

Project activity 2 – Ashoka Cotsyn (3.1 MW) :30/07/2007

C.2.2.2. Length:

>>

10 years and 0 months



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SECTION D. Environmental impacts

>>

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>

The Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification vide S.O. 60(E) dated 27/01/94 has listed a set of industrial activities in Schedule I of the notification which for setting up new projects or modernization/ expansion will require environmental clearance and will have to conduct an Environment Impact Assessment (EIA) study.

The project proponent does not require conducting EIA as the total investment including AI and AC is less than five hundred million Indian rupees.

AI and AC have obtained necessary environmental clearances for consent to operate:

1. Consent and Authorization to Operate from Gujarat State Pollution Control Board (GPCB).
2. Certificate from Office of Chief Electrical Inspector.
3. No objection Certificate (NOC) of Airport Authority of India

The project does not have any major environmental impacts nor is the execution of an Environmental Impact Assessment required. However the beneficial aspects of the project are as follows: -

The project activity results in

- Greenhouse Gas Abatement
- Primary Resource Conservation
- Facilitating sustainable development

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

There are no negative impacts found by the implementation of the project activity.



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SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

The project activity measure implemented at AI and AC utilises NG to generate power used in process requirement. The project activity commissioned by AI and AC had identified different stakeholder at stages in the project. Important stakeholders identified are:

1. Employees
2. Local community
3. Technology supplier
4. Contractor

E.2. Summary of the comments received:

>>

A meeting was held for AI and AC stakeholder comments and a audio video presentation has been enclosed as a supportive to the summary given below:

AI and AC are two yarn spinning units of “The Arvind Mills” who have been proactive in environment and sustainable development measures. Even before the project was conceptualized, the project proponent had identified stakeholders and developed a dialogue for its stakeholders who benefit from the project activity directly and indirectly. The stakeholder engagement was mainly carried out to understand the concerns of the different stakeholder’s and importance of the project activity development. The positive comments received from the engagement have been summarized below:

Employees:

The employees were aware of the project activity through the internal meetings before the commissioning of the project activity. Comments were taken from employees working in Gas engine plant at AI and AC. The employees understand the importance of power for consistent and high quality production at AI and AC. They have appreciated the step taken for reducing the GHG emission and generating environment friendly power to AI and AC. The employees are happy to have work experience with new technology implemented All have unanimously expressed that the project activity is a positive step which will enhance environment in and around plant areas and city.

Local community:

Local community has been an important contributor in development of project activity as some of them are employees of the gas engine plant at AI and AC. Around 22 stakeholders were employed at AI and AC project activity implementation. Businesses like contract jobs and others have been provided by AI and AC because of this activity. The community in and around AI and AC understand the advantages to environment with usage of NG over conventional fossil fuel for power generation.

Technology supplier

The gas engine technology implementer has appreciated efforts of AI and AC to generate power using efficient and low NO_x technology. This technology will aim reducing GHG emissions thus help in reducing local and global environment change.

Contractors:

For maintenance of the project activity 4 persons were hired on contract basis from the nearby local community together at AI and AC. The contractor and its employees were happy to get job at AI and AC.

E.3. Report on how due account was taken of any comments received:

>>

Positive feed backs and comments have been received from different stakeholders listed above for AML project. However as per UNFCCC requirements, the project design document (PDD) will be kept on the website for global stakeholder comments.



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Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY****Contact Information: Arvind Intex**

Organization:	Arvind Intex
Street/P.O.Box:	Rajpur Road, Gomtipur,
Building:	--
City:	Ahmedabad
State/Region:	Gujarat
Postfix/ZIP:	
Country:	India
Telephone:	91-079 - 22167125
FAX:	91-079 - 22138128
E-Mail:	chaitanya.thaker@arvindmills.com
URL:	www.arvindmills.com
Represented by:	
Title:	Chief Manager
Salutation:	Mr.
Last Name:	Thaker
Middle Name:	--
First Name:	Chaitanya
Department:	Engineering
Mobile:	--
Direct FAX:	--
Direct tel:	--
Personal E-Mail:	--



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Contact Information: Ashoka Cotsyn

Organization:	Ashoka Cotsyn
Street/P.O.Box:	Khokhra Mehmdabad
Building:	--
City:	Ahmedabad
State/Region:	Gujarat
Postfix/ZIP:	380 021
Country:	India
Telephone:	91-079 -22770514
FAX:	91-079 – 22771230
E-Mail:	jayraj.kansodaria@arvindmills.com
URL:	www.arvindmills.com
Represented by:	
Title:	Chief Manager
Salutation:	Mr.
Last Name:	Kansodaria
Middle Name:	--
First Name:	Jayraj
Department:	Engineering
Mobile:	--
Direct FAX:	--
Direct tel:	--
Personal E-Mail:	--



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding received for the project activity.

Annex 3

BASELINE INFORMATION

Please refer to section B.4 for baseline and its development for the project activity.

Annex 4

MONITORING INFORMATION

Please refer to section B.7, B.7.1 and B.7.2 explains the monitoring methodology and description of monitoring plan.
