



**CLEAN DEVELOPMENT MECHANISM  
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)  
Version 02 - in effect as of: 1 July 2004)**

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

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**Biodiesel production and switching fossil fuels from petro-diesel to biodiesel in transport sector - 30 TPD Biodiesel CDM Project in Andhra Pradesh, India**

**A.2. Description of the project activity:**

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A.2.1. Purpose of the project activity:

The purpose of the project activity is to manufacture biodiesel from edible / non-edible oils derived from tree borne oil bearing seeds, fatty acids, animal fats etc. for substituting petro-diesel or using as a blend in petro-diesel. The proposed project promotes mitigation of greenhouse gas emissions by partially or fully substituting the petro-diesel in transportation vehicles. Biodiesel is a renewable energy source and contributes to the sustainable development of the region.

A.2.2. View of project participants about the project activity's contribution to sustainable development

The Designated National Authority for CDM in India which is the Ministry of Environment & Forests, has stipulated the following indicators for sustainable development in the interim approval guidelines for Indian CDM projects.

- *Social well being.* The CDM project activity should lead to alleviation of poverty by generating additional employment, removal of social disparities and contribution to provision of basic amenities to people leading to improvement in quality of life of people.
- *Economic well being.* The CDM project activity should bring in additional investment consistent with the needs of the people.
- *Environmental well being.* This should include a discussion of impact of the project activity on resource sustainability and resource degradation, if any, due to proposed activity; bio-diversity friendliness; impact on human health; reduction of levels of pollution in general;
- *Technological well being.* The CDM project activity should lead to transfer of environmentally safe and sound technologies with a priority to the renewables sector or energy efficiency projects that are comparable to best practices in order to assist in upgradation of technological base.

Each of the above indicators has been studied in the context of the project activity to ensure that the project activity contributes to the sustainable development.

*SOCIAL WELL-BEING*

The main raw materials for the production of biodiesel are Pongamia Pinnata and Jatropha Curcas seeds. The project creates a commercial value to these oil bearing seeds neglected so far and income generating opportunities to the tribal and rural people for cultivation and collection of seeds and supply to the project site. It is expected that the price of shelled seeds will be around Rs.300 per ton, which translates into an additional revenue of Rs.1.1 million (US\$24,000) to local tribal and rural people during the first year of project operation and Rs.10.1 millions (US\$220,000) at the end of the crediting period i.e. during 21<sup>st</sup> year of operation of the project or during 2025.



In addition, more than 1000 hectares of wastelands<sup>1</sup> are available within 100 km radius of the project site. Assuming an average density of 16 sq.m per tree, the entire wasteland can support a plantation of 600,000 Pongamia Pinnata / Jatropha Curcas trees. The project activity encourages Pongamia / Jatropha plantation in 1000ha of wastelands within 100 km of the project site and tribal, rural small farmers would be the beneficiaries. Project proponents will supply 600,000 saplings of Pongamia to the rural farmers / tribal people, free of cost, during the next 5 years starting from the year 2005. The new Pongamia plantation starts yielding seeds from the 5<sup>th</sup> year onwards i.e. during 2010 with an expected yield of 100 kg in the first year which increases to 15,000 tons at the end of the crediting period i.e. during 2025. Rural farmers and tribals can sell these seeds to the project and hence new plantations will result in an additional revenues from collection and supply of seeds for biodiesel production to an extent of Rs.0.04 millions (US\$870) during 2010 to Rs.12.1 millions (US\$ 263,000) during 2025.

The project creates direct and indirect employment opportunities for several tribal and rural people. The project employs around 100 persons as permanent staff for operation of the plant and another 60 persons as temporary staff during construction and commissioning of the plant.

Additional employment opportunities will be generated through the installation of expellers for supply of oil to the project. The project proponents also propose to install some of the mechanical expellers at convenient places to crush the seeds and extract raw vegetable oil. Farmers / tribals will supply raw oil in convenient volumes to the project so that logistic problems and costs of transportation are reduced. Presently, about 21 numbers mechanical expellers were installed in Andhra Pradesh and Karnataka States on an experimental basis for extraction of raw vegetable oils from Pongamia and Jatropha seeds by the Indian Institute of Science (IISc), Bangalore. Another 25 nos. of expellers will be installed shortly in the nearby districts. IISc has stated that the existing expellers could produce around 1,200 tons of raw oil per year, out of which only around 500 tons is being used for power generation using small engines. IISc agreed to supply surplus raw vegetable oils to the project and has expressed that about 1,500 tons of raw vegetable oil would be available per year after installation of all the proposed mechanical expellers. Further, IISc has also expressed that they could collect seeds from other places of the country to an extent of 100 tons per day. Hence, sufficient quantity of seeds and raw vegetable oils will be available for the production of biodiesel. This scenario translates into new opportunities in rural villages due to the project activity.

In summary, the project activity contributes to social well being of the rural poor, tribals and small farmers and helps in the removal of social disparities and help in alleviation of poverty by providing new opportunities for employment and income.

#### *ECONOMIC WELL BEING*

The project creates investment opportunities for the local entrepreneurs in small seed crushing units that supply raw oil to the project. It also creates opportunities for local NGOs to employ tribal and rural youth for collection of seeds and supply to the expellers. It is estimated that about 350 tribal / rural farmers will be benefited during the first year by collecting seeds from existing sources which would reach to about 3000 persons towards the end of crediting period. Majority of the investment spent by the project proponents towards purchase of raw vegetable oils will go to the tribal or rural farmers.

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<sup>1</sup> Wastelands by definition are owned by the government as per the constitution. These lands are generally fallow and do not have forests or other productive lands.



Biodiesel has other economic benefits to the nation. It will help in reducing the burden of imports, India largely relies on imported petroleum to an extent of around 70% of which is on crude oil. its requirements. Importing petroleum at this proportion puts pressure on the national exchequer heavily and the Indian economy subjects to heavy fluctuations depending on fluctuations in the International oil prices. In this context proposing a project that substitutes the petro-diesel makes economic and strategic sense. So far no biodiesel project has been set up in India. Once the proposed project comes into operation, more and more such projects are likely to come up, which would result in substantial national economic benefits.

Hence, the project activity contributes to the economic development of the host country and result in mobilisation of additional investments consistent with the needs of the people.

#### *ENVIRONMENTAL WELL-BEING*

The project promotes use of biodiesel, which is a renewable fuel. It is clean, safe, biodegradable and free of Sulphur as compared with the petro-diesel. Combustion of bio-diesel reduces serious air pollutants such as soot, particulates, carbon monoxide, hydrocarbons and air toxics. It has superior lubricant properties than petro-diesel. The use of biodiesel in existing engines has been demonstrated during experiments and trial runs in various research institutions in India. Thus, biodiesel can be used as substitute fuel to petro-diesel in transportation vehicles and stationary applications. Hence use of biodiesel is environmentally safe and reduces local air pollution.

Further, substitution of petro-diesel with biodiesel in Compression Ignition (CI) engines results in reduction of anthropogenic GHG emissions through avoidance of carbonaceous fossil fuels. The source of raw materials for biodiesel manufacturing is Pongamia and Jatropha seeds, which are grown on trees. The trees fix carbon by photosynthesis via the carbon cycle. When the oil derived from these seeds is burnt same amount of CO<sub>2</sub> is emitted as was sequestered. Thus, the proposed project leads to “No net addition of CO<sub>2</sub> to the atmosphere. In addition, the proposed project activity would encourage plantation of new Pongamia and Jatropha trees in wastelands, thus contributing to wasteland utilisation. This also results in conserving carbon in the topsoil. Hence, the project activity results in global environmental benefits by way of mitigation of greenhouse gases in several ways.

Project capacity is 30 TPD and it is expected that the project would operate at 70% capacity during the first year and 90% capacity from the second year onwards. At this capacity utilisation, the plant will require about 7,000 tons of raw oils during the first year and 9,000 tons from second year onwards. The present sources and anticipated plantation of Pongamia and Jatropha trees in wastelands would be able to supply around 6000 tons of raw vegetable oil per year during the first year of plant operation and it is expected that the availability is expected to increase every year with the increase in plantation and yield of seeds from trees. However, there would be a shortage in supply of raw oils for some time. To overcome the shortage of raw oils, the project proponents proposed to utilise distillery fatty acids (recovered from palm oil refineries), acid oils (recovered from vanaspathi refineries), fatty acids (animal fats), rice bran, neem oils etc. One estimate indicates that these fatty acids are available in surplus in Andhra Pradesh to an extent of over 35,000 tons per year. It was noticed that most of these acids are being disposed since no commercial application is established as yet. Hence, proposing to use waste fatty acids and acid oils for biodiesel production eliminates environmental problems resulting from present disposal methods.

Further, the seed cake and phyto chemicals produced by the project activity as by products can be used as a bio-fertilizer in agricultural fields due to rich nitrogen content and minerals as per the lab test carried



out by ICRISAT (International Crops Research Institute for Semi Arid Tropics). Results<sup>2</sup> of tests conducted on seed cake by ICRISAT are furnished below in Table 1. Further, the biodiesel manufacturing from seeds results in phytochemicals as by products to about 2% of the production capacity and phytochemicals also has an application in agricultural fields as a bio-fertilizer. The proposed project at its maximum capacity would produce around 2,500 tons of phyto chemicals and seed cake during the first year and 16,000 tons per year at the end of the crediting period. Cumulatively, the project results in production of 195,000 tons of phytochemicals and seed cake during the crediting period. Use of phytochemicals and seed cake in agricultural fields replace the utilisation of energy intensive chemical fertilizers and hence, the proposed project would conserve energy and eliminate environmental problems associated with chemical fertilizer manufacturing, in proportion to the bio-fertilizers from project activity.

Table 1: Comparison of seed cake with DAP and UREA

Source of fertilizer	Nitrogen (N)	Phosphorus (P)	Potassium (K)
Pongamia Pinnata (Powerguda village)	3.95	0.52	0.42
Pongamia Pinnata (Jainoor town)	4.6	0.54	0.56
Jatropha curcas	4.44	2.09	1.68
Neem	5.0	1.0	1.5
Castor	4.37	1.85	1.39
Cow manure	0.97	0.69	1.66
Chicken manure	3.04	6.27	2.08
Di-Ammonium Sulphate (DAP)	18	20	0
Urea	46	0	0

In view of the above, the proposed project activity contributes to the environmental well-being of the host country.

#### TECHNOLOGICAL WELL-BEING

So far, the biodiesel manufacturing is confined only to laboratories in India. Only laboratory trials and a few field trials have been conducted on use of biodiesel in transport vehicles. Hence, the project activity results in removal of a barrier that is preventing transfer of technology from the laboratory to the industry. Further, the project activity promotes large-scale substitution of petro-diesel with biodiesel and results in technological well being.

In summary, the proposed project activity contributes to the following global and local benefits.

1. Alleviation of poverty and social disparity in rural areas by creating additional opportunities for collection and extraction of raw vegetable for the biodiesel plant
2. Creation of direct and indirect employment during construction and operation of the project and increase in incomes to rural people.
3. Development of wastelands for afforestation activities through new oil seed plants, improving the ecological balance and increase in forest / green cover.
4. Substitution of petro-diesel to improve the local air environment and to mitigate CO<sub>2</sub> emissions for global GHG mitigation

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<sup>2</sup> Emmanuel D'Silva, Suhas Wani, and Basre Nagnath. 2004. "The Making of a New Powerguda: Community Empowerment and New Technologies Transform a Problem Village in Andhra Pradesh." Patancheru, Andhra Pradesh: International Crops Research in the Semi-Arid Tropics (ICRISAT)



5. Improving the national economy by contribution towards reduction of oil imports
6. Establishes a technology for biodiesel manufacturing in India and sets a model for more such industries to be set up in the future.

For these reasons, the proposed project activity contributes to the sustainable development in the host country.

**A.3. Project participants:**

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As yet, the project has only one participant entity, Southern Online Bio Technologies Ltd., a private legal entity registered under the Companies Act. in India, which will bring in the required capital for setting up the project at its own risk and take decisions with regard to the transaction of emissions credits. Contact details of the above project participant are given in Annex I.

**A.4. Technical description of the project activity:****A.4.1. Location of the project activity:**

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**A.4.1.1. Host Party(ies):**

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India

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

&gt;&gt;

Andhra Pradesh

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

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Samsthan Narayanapur Village, near Hyderabad

**A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):**

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The project location is in a rural area at Samsthan Narayanapur Village, Nalgonda District, in Andhra Pradesh State. The project location is accessible by road from Hyderabad, which is the capital city of Andhra Pradesh state and is situated at a distance of 50 km from the project location. Hyderabad city is well connected to the rest of the country by road, rail and air.

**A.4.2. Category(ies) of project activity:**

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The project activity falls under “Switching fossil fuels” category. According to the CDM modalities and procedures, the sectoral scope of the project activities could be “Transport” which has sectoral scope number 7, since, the application of the biodiesel in transport vehicles.

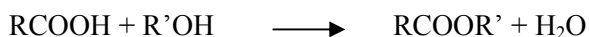
According to small scale modalities and procedures, “Switching fossil fuels” will come under type III.B.

**A.4.3. Technology to be employed by the project activity:**

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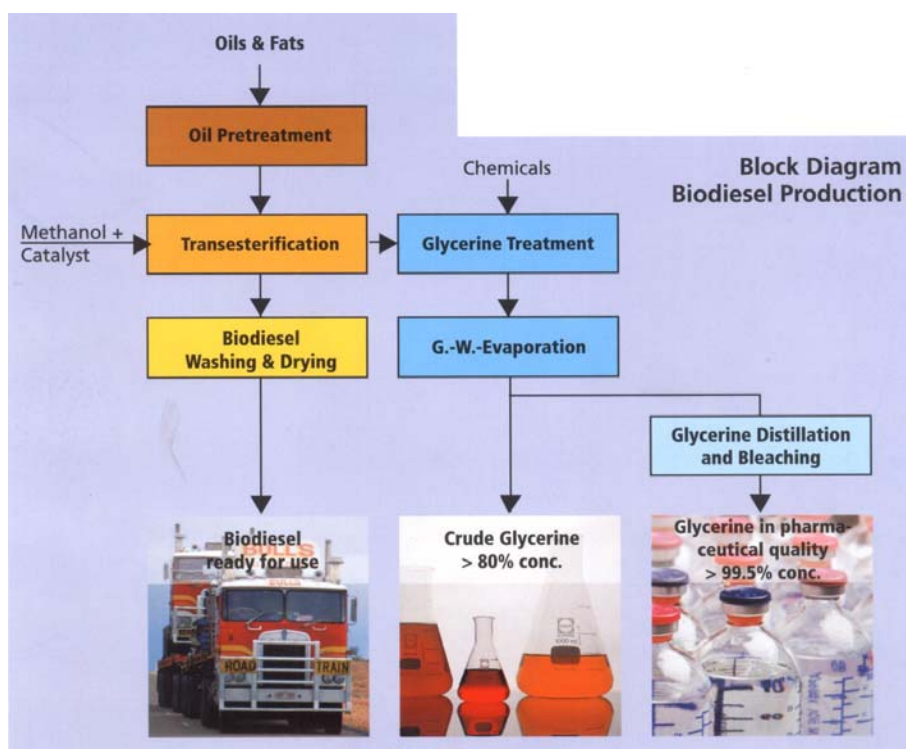
**Technology Description**

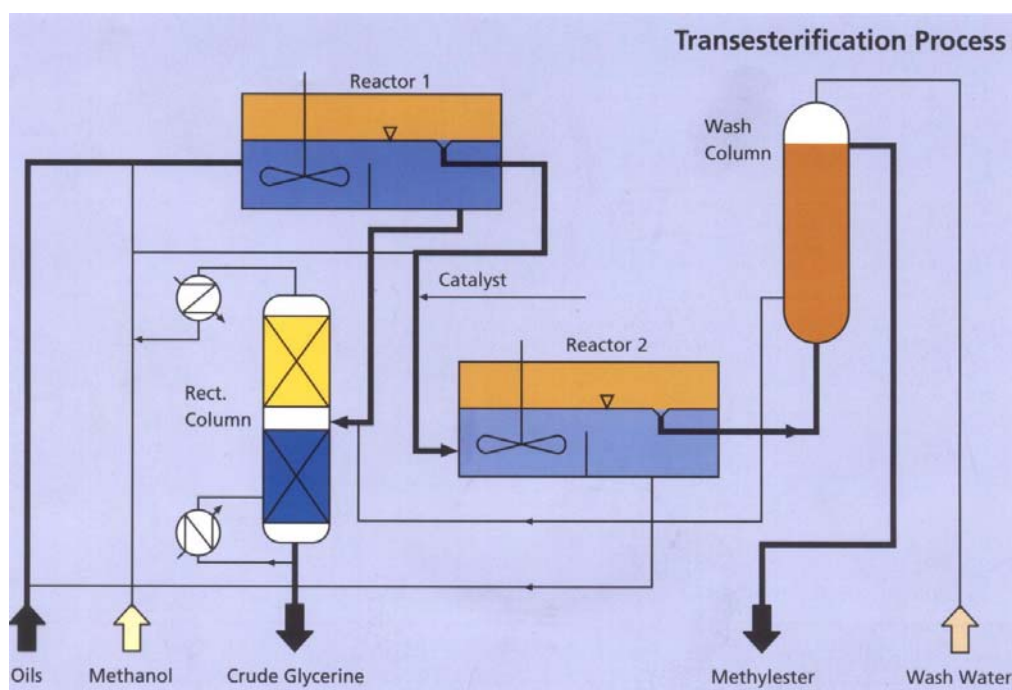
The technology of biodiesel manufacturing involves pre-treatment of raw oils, acid oils / fats, esterification / trans-esterification using Methanol / Ethanol and chemical catalysts and then finally washing and drying to obtain the bio-diesel. Block diagrams showing the proposed process are furnished below.



Project activity involves manufacture of biodiesel (methyl esters of fatty acids) from Pongamia and Jatropha seeds in 100% grade of methyl esters, called B100 Biodiesel. The same will be delivered to filling stations where B100 biodiesel will be blended in petro-diesel to make it B5 or B20 grade biodiesel, as required, in the ratio of 5% and 20% respectively.

Generally, to produce 1 ton of B100 biodiesel, 1 ton of raw vegetable oils are required. Apart from the raw vegetable oil, other process inputs such as Methanol / Ethanol, Catalysts, etc. are also required.





*Block diagrams showing the process of biodiesel manufacturing*

### Technology Transfer

Implementation of the project will be entrusted to Chemical Construction International Ltd., (CCIL) a New Delhi based engineering and technology company, which has an exclusive technical collaboration with Lurgi Life Sciences, Germany, a leader in fatty acids, glycerol and bio-diesel technologies. Earlier, under Lurgi's technical supervision, CCIL has implemented several fatty acids and glycerol processing plants in India. Hence, Lurgi's biodiesel technology flows to India through CCIL. No direct technology transfer agreement exists between the project proponents and Lurgi.

**A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:**

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The project activity reduces anthropogenic greenhouse gases by substituting the petro-diesel with the biodiesel. In other words, biodiesel avoids GHG emissions from burning of petro-diesel. Burning of petro-diesel in combustion engines releases GHG emissions such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). It is anticipated that the biodiesel project will produce around 27 tons of biodiesel per day or 8910 tons per year. Assuming the national CO<sub>2</sub> emission factor for petro-diesel, the project will avoid GHG emissions of around 27,851 tons CO<sub>2</sub> emissions by fuel switching. Considering the project emissions, biodiesel project will generate around 26,792 tons of emission reductions per year. The above emission reductions do not occur in the absence of the proposed activity, since, in the business as usual scenario use of petro-diesel would continue. As the proposed project is first of it's kind in India it faces several barriers. There are no official regulations or guidelines in India that mandates the use of biodiesel or setting up of biodiesel plants. Technology of biodiesel manufacturing is not yet commercially established in India.





Emissions reductions are proportional to the quantity of petro-diesel substituted by the biodiesel consumed by transport vehicles. The tests conducted so far at the IISc Bangalore have indicated that the biodiesel would not lead to a major derating of the existing engines. Emissions coefficients of petro-diesel are used as baseline emission factors and the same are applied to the quantity of biodiesel substituted. It is estimated that the project activity avoids 27,851 tCO<sub>2</sub>e emissions every year and generates around 26,792 CO<sub>2</sub> emissions reductions units.

**A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:**

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The crediting period chosen for the project activity is 21 years with 2 renewals at each 7 year interval. An annual estimate of emission reductions due to the project is furnished below.

Year	2005	2006	2007	2008	2009	2010	2011
Emission reductions	20,842	26,792	26,792	26,792	26,792	26,792	26,792

**A.4.5. Public funding of the project activity:**

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No public funding from parties included in Annex I is involved in the project activity.

**SECTION B. Application of a baseline methodology**

**B.1. Title and reference of the approved baseline methodology applied to the project activity:**

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No baseline methodologies that are applicable to the project activity have been approved or proposed to date. Hence, the project participants proposed a new baseline methodology for the project activity in the form CDM-NMB with the title given below.

**“Biodiesel Production and switching fossil fuels from petro-diesel to biodiesel in transport sector”**

**B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:**

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A new methodology was proposed for the biodiesel production project keeping in view the characteristics and emissions sources for the present project activity. To date no methodology has been proposed to the UNFCCC for similar project activities. Hence, a new baseline methodology is developed to suit the present project case and is provided in a separate form in CDM-NMB. Hence, the new baseline methodology suits the present project case which meets all the conditions and categories specified as specified below.

The proposed project activity meets the following conditions as specified in the baseline methodology.

- Proposed project produces biodiesel for partial or full substitution of the petro-diesel with biodiesel in mobile combustion for road and rail transport



- b) Biodiesel production plant is included within the activity and the biodiesel plant developer owns CERs since the proposed project is a first of its kind in India and certified emission reductions are generated solely by the initiative of the project developer. Project proponents will enter into agreement with biodiesel consumers such that consumers will not claim CERs for the biodiesel consumed and additional revenues from the sale of certified emission reductions by project proponents will be passed on to biodiesel consumers as subsidy on the sale price of biodiesel. This arrangement will avoid duplication of ownership of emission reductions and double counting. The technology to be used by in the proposed biodiesel plant will be esterification and transesterification using ethanol or methanol.
- c) The proposed project utilises various feedstock such as edible / non-edible oils derived from oil bearing seeds such as pongamia pinnata, jatropha curcas, soyabean, sunflower etc., waste oils, fatty acids, etc. which are otherwise neglected or dumped.
- d) The proposed project does not claim emission reductions from chemical fertiliser replacement with oil cake and from carbon sequestration from new plantations grown for biodiesel production or any other emission reductions.
- e) Presently there are no regulations exist in India on biodiesel production and utilisation

Hence, the baseline methodology suits the proposed project activity.

<b>B.2. Description of how the methodology is applied in the context of the project activity:</b>
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The baseline methodology identified the following three alternatives or baseline scenarios to the project activity.

- a) Substituting petro-diesel with biodiesel i.e. proposed project not undertaken as a CDM project
- b) Continuation of existing practice of using petro-diesel.
- c) Petro-diesel substitution with CNG, LNG or LPG

The baseline methodology required detailed analysis of national circumstances and policies to determine the most appropriate baseline scenario that reasonably represent the anthropogenic emissions of greenhouse gases in the absence of the project activity. The following analysis indicates that in the absence of the proposed project activity, the baseline scenario is continuation of the existing practice of using the petro-diesel without any substitution.

Several strategies have been proposed to mitigate transport sector GHG emissions and can be classified into fuel efficiency improvements, system efficiency improvements, modal shift changes, behavioural changes and technological changes<sup>3</sup>. All strategies other than technological changes are not technically and economically comparable with technological changes in terms of carbon abatement costs and benefits. Technological changes include vehicle retrofits, fuel switching with alternative fuels like CNG, LNG, LPG etc.

Development of alternative fuels such as CNG, LPG and LNG requires creation of additional infrastructure to handle and distribute CNG and LNG fuels for transport sector. In addition vehicle engines need additional retrofits to use CNG and LNG. All these measures require huge investments both for the government in creation of infrastructure as well as vehicle owners for retrofits. Hence, CNG and LNG in India could not penetrate widely into the transport sector. To date, though several studies and initiatives are being taken by the Government, only CNG could be implemented in New Delhi that too

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<sup>3</sup> Sectoral economic costs and benefits of GHG mitigation, by Ranjan K Bose.



only partial fleet is converted to CNG powered vehicles. LPG is commercially a viable option where low cost LPG is available. However, in India LPG is being used as a primary domestic fuel for heating and cooking. Indigenous supply of LPG is expected to fall much short of the household demand alone. As such LPG is not a competitive auto fuel. Report of the expert committee on Auto Fuel Policy noted the above points. Hence, development of other alternative fuels such as CNG, LNG and LPG are not realistic and credible baselines for the project activity.

Other alternative fuels such as ethanol also faces several barriers for implementation in India such that it could not widely penetrate in the Indian transport sector. It is pertinent to mention here that after a long time of debates and study by several committees, the GoI has begun the blending of biomass derived ethanol in petrol up to 5% in nine states where sugarcane based molasses are available. In spite of being no technological difficulties and abundant availability of molasses derived ethanol, this took several years.

In respect of biodiesel, as on date there are no enforcement regulations on emissions and no policy is available at the national level. Although stringent norms for emissions from diesel engines are proposed, their implementation in the country was delayed by over an year. Moreover, the auto fuel policy announced by the GoI to address the directives of the Supreme Court of India also focus on alternative fuels such as CNG, LPG and existing fuels meeting the Euro norms.

To date, Government of India has not officially announced any policy for biodiesel development in India. However, Planning Commission has released the “Report of the Committee on Development of Biofuel”. The report recommends implementation of a National Mission in two phases. The first phase involves plantation of *Jatropha Curcas* in 400,000 ha of land in 8 states of India at a cost of Rs.14960 millions. The time limit specified by the planning commission for the 1st phase is 2006-2007. A pilot biodiesel plant is proposed to be set up by the year 2007 that utilises the seeds from new plantations as feedstock. As can be seen that the first phase itself is highly cost intensive requiring huge financial resources which have to be mobilized within a short span of 4 years. Hence, this phase is a difficult task and uncertain. The final programme under the phase II will be formulated only during 2006-07 and comprise an action plan for the period ending 2011-2012. Hence, it is highly unlikely that any regulation will be enforced in the near future that allows wide spread implementation of biodiesel projects and biodiesel utilisation. Further, in the absence of an established and commercial technology, under the influence of various barriers for the biodiesel utilisation, implementing a biodiesel project is highly unlikely.

In view of all the above, the baseline scenario in the absence of the project activity, is continuation of the existing practice of using petro-diesel.

<b>B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:</b>
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The baseline methodology applied for the project activity proposed to demonstrate the additionality using the consolidated tool agreed by the Executive Board at its 16<sup>th</sup> meeting. The consolidated tool on additionality is a step by step approach which is applied as follows.

Step 0: Preliminary screening of projects started after 1 January 2000 and before 31 December 2005.

The proposed project activity will start during September 2005. Hence, this step is applicable to the proposed project activity. As per the consolidated additionality tool, if the project starting date falls



between 1 January 2000 and the date of registration of first CDM project activity and prior to 31 December 2005 evidence should be publicly provided that the CDM incentive provided by the CDM was seriously considered in the decision to proceed with the project activity. However, this step is not applicable for the present project activity since the project implementation is not yet started and requests for registration of first CDM project activities are already started. Project proponents have necessary evidences to demonstrate that the CDM incentive was seriously considered. Hence, the project passes this step to the next step.

### Step 1: Identification of alternatives to the project activity

#### *Sub-step 1a: Define alternatives to the project activity*

As described in the baseline methodology, the project activity has two alternatives that are realistic and credible, as given below.

- a) Substituting petro-diesel with biodiesel i.e. proposed project activity not undertaken as a CDM project activity
- b) Continuation of existing practice of using petro-diesel.

Further elaboration on the above alternatives is furnished in section B.2 above.

#### *Sub-step 1b. Enforcement with applicable laws and regulations*

All alternatives defined above are in compliance with all applicable legal and regulatory requirements.

As detailed in the previous section (B.2), the appropriate baseline scenario that represents the GHG emissions in the absence of the project activity is the continuation of existing practice of using the petro-diesel in transport sector and the proposed project activity is not the only alternative. Hence, the project passes this step to the next step.

### Step 3: Barrier Analysis

The consolidated additionality tool provides for selection of either Step 2: Investment Analysis or Step 3: Barrier Analysis. Project proponents selected Step 3: Barrier Analysis for the proposed project activity, since, the project is first of its kind in India facing several barriers. This step has two sub-steps as given below.

#### *Sub-step 3a: Identify barriers that would prevent a wide spread implementation of the proposed project activity.*

The following barriers are identified for the proposed project activity.

*Investment barriers.* The project is first of its kind in India in this sector, therefore, it is open to some implementation risks. Although the biodiesel manufacturing is already established in other countries such as United States of America, European Countries etc., it has not been successfully implemented in India. So far, the technology is confined to the laboratories only and is successfully tested in laboratories and research organisations such as Indian Institute of Technology, New Delhi, Indian Institute of Petroleum, Dehradun, Indian Oil Corporation Ltd. and Indian Institute of Science, Bangalore. Only a few field trials have been conducted on use of biodiesel in road vehicles and rail engines in India. Lack of experience on use of biodiesel has prevented the large scale transfer of technology from laboratory to the industry. The biodiesel technology needs elaborate infrastructure and an advanced technology. Due to the risks



associated with such a new technology, convincing investors to invest in biodiesel projects is very difficult and so far virtually there is no support from funding agencies within India to promote biodiesel projects.

*Technological Barriers.* Being a technological front runner, there are various technological concerns such as performance uncertainty of the biodiesel technology, uncertainty with regard to the quality control and quality assurance, apprehension about vehicular performance with new fuel, emission control norms etc. Doubts regarding performance of existing engines with biodiesel blends are still prevalent. Even though the technology is proven in other countries, it is not able to get hold in India due to the above concerns. Further, there is a need for skilled labour and / or training to operate and maintain this new innovative technology as well as to maintain vehicles using biodiesel.

*Barriers due to prevailing practice.* Due to the technological concerns noted above, there is lack of will to change over to biodiesel from petro-diesel. One apprehension is that the biodiesel may affect vehicular performance anticipating poor quality biodiesel due to lack of proper experience in biodiesel technology. Hence, most vehicle owners prefer to continue using petro-diesel instead of switching over to biodiesel.

*Other barriers.* As noted above, there is a lack of previous experience using the biodiesel technology both on the front of biodiesel production and the usage of biodiesel in road transport vehicles. Further, during initial years of plants operation, the preference will be to use lower blends of methyl esters, say, in 5% biodiesel blend making the project activity less attractive.

Another noteworthy barrier is the preference of users for price competitiveness with petro-diesel. Users prefer biodiesel only if the price is set below the market price of petro-diesel irrespective of costs of production. This proves to be a significant barrier to the project promoters of biodiesel projects.

Since, raw materials are widely dispersed, in small quantities; huge human resources are required for collection of seeds. This may get aggravated due to lack of proper experience in collection of seeds and mobilisation of resources. Further, during the initial stages, the remunerative prices to tribal / farmers for collection of seeds, being small, it is very difficult to convince and engage human resources. Unless the new community plantation starts yielding seeds, collection of seeds would be very difficult and expensive.

Notwithstanding the recommendations of the Committee on Development of bio fuels, there is no policy for setting up biodiesel projects. No incentives are available to encourage setting up biodiesel projects, no framework for removal of barriers facing biodiesel projects, no guidelines are available in India for biodiesel projects and no economic incentives are proposed for actual biodiesel consumers.

Hence, the project activity faces several barriers that prevent the project activity from occurring.

Expert judgement for the above barriers is available from an independent entity Indian Institute of Science, Bangalore.

*Sub-step 3a: Show that the identified barriers would not prevent a wide spread implementation of at least one of the alternatives*

The identified barriers are not affecting the other alternatives identified in Step 1, which is continuation of existing practice of using petro-diesel that is already widespread and viable. Hence, the proposed project activity passes this step to the next step.

Step 4: Common practice analysis

As already mentioned earlier, the proposed project is first of its kind in India. Hence, the project activity passes the common practice analysis.

Step 5: Impact of CDM registration

Approval and registration of the project as a CDM project enable the project promoters to reduce the sale price of the biodiesel in proportion to the benefits received by selling emission reductions. This reduced price enables the biodiesel to penetrate into the market and remove the barriers that exist in respect of market conditions and low motivation to switch over to the biodiesel. Further, CDM status of the project activity will alleviate implementation risks and investment risks.

**B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:**

>>

Project boundary is the physical project site within which the biodiesel production plant is constructed and the fleet of vehicles using biodiesel. Inclusion of biodiesel production plant within the project boundary enables to ensure that all emissions caused during the manufacture of biodiesel are considered as project emissions. Transportation of biodiesel from the project to filling stations, transportation of feedstocks, chemicals and other process inputs are included within the project boundary, in order to include transportation emissions in project emissions. The inclusion of the vehicle covers the combustion sources where the petro-diesel is substituted by biodiesel and GHG emissions are avoided due to fuel switch.

In other words, the spatial extent of the project boundary includes

- a) the biodiesel production plant site
- b) transportation of biodiesel and feedstocks
- c) combustion sources or vehicles that substitute petro-diesel with biodiesel (i.e. use of biodiesel)
- d) preparation / harvesting of oil bearing seeds from new plantations

Sources of feedstocks such as waste oils, fatty acids, etc. and sources of chemicals such as methanol are located outside the project boundary. Increase in emissions outside the project boundary due to the consumption of methanol are considered as leakage emissions in this methodology.

Oil cake produced during extraction of raw oil from seeds is a rich nitrogenous fertilizer that can replace chemical fertilizers. However, since oil extraction is located outside the project boundary, these emissions are not accounted for in the methodology.

**B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:**

>>

Date of completion of the baseline : **16 April 2005**

Contact of information of the entity who determined the baseline :

Organization:	ZENITH CORPORATE SERVICES (P) LTD.
Street/P.O. Box, Building:	10-5-6/B, MYHOME PLAZA, MASABTANK,



City:	HYDERABAD
State/Region:	ANDHRA PRADESH
Postfix/ZIP:	500028
Country:	INDIA
Telephone:	+91-40-2337 6630, 2337 6631
FAX:	+91-40-2332 2517
E-Mail:	<a href="mailto:zenithenergy@sancharnet.in">zenithenergy@sancharnet.in</a>
URL:	<a href="http://www.zenithenergy.com">www.zenithenergy.com</a>
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	Mohan
First Name:	Attipalli

The above entity is not included as project participant in Annex.1.

### **SECTION C. Duration of the project activity / Crediting period**

#### **C.1 Duration of the project activity:**

##### **C.1.1. Starting date of the project activity:**

&gt;&gt;

01 September 2005

##### **C.1.2. Expected operational lifetime of the project activity:**

&gt;&gt;

25y-0m

#### **C.2 Choice of the crediting period and related information:**

##### **C.2.1. Renewable crediting period**

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

&gt;&gt;

01 September 2005

###### **C.2.1.2. Length of the first crediting period:**

&gt;&gt;

7y-0m

##### **C.2.2. Fixed crediting period:**

###### **C.2.2.1. Starting date:**

&gt;&gt;

###### **C.2.2.2. Length:**

&gt;&gt;

**SECTION D. Application of a monitoring methodology and plan****D.1. Name and reference of approved monitoring methodology applied to the project activity:**

&gt;&gt;

No monitoring methodologies that are applicable to the project activity have been approved to date. Hence, project proponents proposed a new monitoring methodology for the project activity. The title of the proposed new monitoring methodology is given below.

**“Monitoring methodology for emissions from biodiesel production and switching fossil fuels from petro-diesel to biodiesel in transport sector”**

**D.2. Justification of the choice of the methodology and why it is applicable to the project activity:**

&gt;&gt;

A new methodology is proposed for the biodiesel production project keeping in view the emissions sources and monitoring requirements for the project activity. To date no methodology has been proposed to the UNFCCC for similar project activities. Hence, a methodology is designed to suit the present project case and is provided in a separate form in CDM-NMM. Hence, the new monitoring methodology suits the present project case which meets all the conditions and categories specified in the new monitoring methodology, as follows.

- a) Proposed project produces biodiesel for partial or full substitution of the petro-diesel with biodiesel in mobile combustion for road and rail transport
- b) Biodiesel production plant is included within the activity and the biodiesel plant developer owns CERs since the proposed project is a first of its kind in India and emission reductions are generated solely by the initiative of the project developer. Project proponents will enter into agreement with biodiesel consumers such that consumers will not claim CERs for the biodiesel consumed and additional revenues from the sale of certified emission reductions by project proponents will be passed on to biodiesel consumers as subsidy on the sale price of biodiesel. This arrangement will avoid duplication of ownership of emission reductions and double counting. The technology to be used by in the proposed biodiesel plant will be esterification and transesterification using ethanol or methanol.
- c) The proposed project utilises various feedstock such as edible / non-edible oils derived from oil bearing seeds such as pongamia pinnata, jatropha curcas, soyabean, sunflower etc., waste oils, fatty acids, etc. which are otherwise neglected or dumped.
- d) The proposed project does not claim emission reductions from chemical fertiliser replacement with oil cake and from carbon sequestration from new plantations grown for biodiesel production or any other emission reductions.
- e) Presently there are no regulations exist in India on biodiesel production and utilisation

Hence, the monitoring methodology suits the proposed project activity.



**D.2.1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario.****D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:**

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	Electricity consumed by project and oil extraction activities	Bills from electric utility	kWh	m	Monthly	100%	paper	This data item is used for estimating project induced emissions due to usage of electricity for plant operation
2	Grid emission factor	Official statistics	tCO <sub>2</sub> /MWh	e	Yearly	100%	paper	Calculated according to ACM0002.
3	Petro-diesel consumed for off-site transport	Fuel bills of transport providers	t	c	Monthly	100%	paper	Transportation of biodiesel, raw materials and byproducts will be contracted to outside parties and delivery notes submitted by outside parties will be used to calculate emissions from offsite transport.
4	Quantity of fossil fuels used on site	Fuel bills	t	m	Monthly	100%	paper	Fossil fuel delivery documents by suppliers and purchase bills will be used for verification.
5	Emission factors for fossil fuels used on site for CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O and oxidation factor	National factors or IPCC emission factors	g/kg	e	Annual	100%	paper	IPCC emission factors will be used if national emission factors are not available.

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Other parameters as listed in the new monitoring methodology such as Emission factor for vegetation clearance, vegetation clearance for new plantations etc. are not applicable for the project activity, since, project proponents intend to encourage new plantations only in vacant lands and farm bunds by farmers and rural people that require no land clearance. Further, project proponents / plantation developers do not use any fossil fuels for new plantation. These aspects can be verified by DOE during validation and verification. However, this aspect will be decided during the course of project implementation and if required monitoring parameters for new plantations as listed in the monitoring methodology will be incorporated in the final PDD.

**D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO<sub>2</sub> equ.)**

>>

The following formulae as provided in the new baseline methodology is used for estimating emissions from the project activity.

Emissions from electricity consumption :

$$\begin{array}{lclcl} \text{Emissions} & & \text{electricity} & & \text{grid emission} \\ \text{from electricity} & = & \text{consumed} & \times & \text{factor} \\ (\text{tCO}_2/\text{yr}) & & (\text{MWh} / \text{yr}) & & (\text{tCO}_2/\text{MWh}) \end{array}$$

Emissions from fossil fuel consumption

$$\begin{array}{lclcl} \text{Emissions from} & & \text{Fossil fuel} & & \text{Fuel specific} \\ \text{Fossil fuel} & = & \text{consumed} & \times & \text{Emission factor} \\ \text{Consumption} & & & & \\ (\text{tCO}_2/\text{yr}) & & (\text{t}) & & (\text{tCO}_2\text{e}/\text{t}) \end{array}$$

Off-site transport emissions:

$$\begin{array}{lclcl} \text{Transport} & & \text{Petro-diesel} & & \text{Emission} \\ \text{emissions} & = & \text{consumed} & \times & \text{factor} \\ (\text{tCO}_2\text{e} / \text{yr}) & & (\text{t} / \text{yr}) & & (\text{tCO}_2\text{e} / \text{t fuel}) \end{array}$$



<b>D.2.1.3. Relevant data necessary for determining the <u>baseline</u> of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :</b>								
ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
1	Quantity of Biodiesel produced	Project operation records	tons	m	Daily	100%	Paper	
2	Quantity of biodiesel consumed	Sales records submitted by retail outlets	t	m	monthly	100%	paper	Biodiesel sales records submitted by retail outlets will be used to estimate the biodiesel consumed.
3	CO <sub>2</sub> e emission factor for petro-diesel	National data / IPCC emission factors	g/kg of fuel	e	Annual	100%	Paper	CO <sub>2</sub> emission factor is either obtained from the national data or estimated based on carbon content or the lowest IPCC emission factor for diesel vehicles will be taken.
4	Oxidisation factor for petro-diesel	Publicly available sources	%	e	annual	100%	paper	
5	Efficiency multiplier of petro-diesel	Publicly available sources	%	e	annual	100%	paper	



**D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO<sub>2</sub> equ.)**

&gt;&gt;

The following formula as provided in the new baseline methodology is used for estimating emissions from the project activity.

$$\begin{array}{ccccccc} \text{Baseline} & = & \text{Biodiesel} & & \text{CO}_2\text{e Emission} & & \text{Efficiency multiplier of} \\ \text{emissions} & & \text{Consumed} & \times & \text{factor} & \times & \text{petro-diesel (\% biodiesel motor /} \\ (\text{tCO}_2\text{e / yr}) & & (\text{t / yr}) & & (\text{tCO}_2\text{e / t fuel}) & & \text{petro-diesel motor}) \end{array}$$

The following formula will be used for calculation of emission factor.

$$\begin{array}{ccccccc} \text{Baseline CO}_2 & = & \text{Carbon} & \times & \text{Oxidisation} & \times & \text{Conversion} \\ \text{Emissions} & & \text{content in} & & \text{factor} & & \text{factor} \\ (\text{tCO}_2 / \text{t fuel}) & & \text{petro-diesel} & & (\%) & & (\text{tCO}_2 / \text{tC}) \\ (\text{tCO}_2 / \text{t fuel}) & & (\text{tC / t fuel}) & & & & \end{array}$$

**D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).**

Option 2 is not selected. Hence, this item is not applicable to the present project activity

**D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:**

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

**D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO<sub>2</sub> equ.):**

&gt;&gt;

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

**D.2.3. Treatment of leakage in the monitoring plan****D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity**

ID number (Please use numbers to ease cross-referencing to table D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
1	Methanol consumed	Plant operation records	T	m	monthly	100%	paper	This data item will be used for estimating project induced emissions for methanol production outside the project boundary.

**D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO<sub>2</sub> equ.)**

&gt;&gt;

The following formula as provided in the new baseline methodology is used for estimating emissions from the project activity.

$$\begin{array}{lcl} \text{Methane} & & \text{Methanol} \\ \text{Emissions} & = & \text{consumed} \\ & & \text{by project} \\ (tCO_2e / yr) & & (t/yr) \end{array} \quad \times \quad 0.002 \quad \times \quad 21$$

**D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO<sub>2</sub> equ.)**

&gt;&gt;

The emission reductions by the project activity during a given year are calculated as under.

$$\text{Emission Reductions} = \text{Baseline Emissions} - \text{Project Emissions} - \text{Leakage}$$



<b>D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored</b>		
Data (Indicate table and ID number e.g. 3.-1.; 3.2.)	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.2.1.1.1	Low	This data item is required for estimating the project emissions from electricity consumption. The electricity consumed will be monitored by the electricity supplier using calibrated tamper proof electricity meter installed within the project premises. Bills of the electricity supplier will be verified. Electricity meters will be periodically calibrated according to the industry standards or as recommended by the electricity supplier.
D.2.1.1.2	Low	This data item is obtained from national statistics. Hence, QA/QC of this data item is not in the control of project proponents.
D.2.1.1.3	Medium	This data item is required for estimating the project emissions due to off-site transport distance. Project proponents shall maintain the records of the petro-diesel purchased for transport vehicles. Bills and the amount paid towards the petro-diesel shall verified.
D.2.1.1.4	Low	This data item is required for estimating the project emissions due to on-site fossil fuels use. Project proponents shall maintain the records of the fuel deliveries. Bills and the amount paid for fuel shall be verified.
D.2.1.1.5	Low	Data come from national statistics or IPCC good practice guidance
D.2.1.3.1	Low	Two numbers of tamper proof electronic flow meters will be installed at the final product outlet point to measure and record the flow of outlet biodiesel. Flow meters will be subjected to periodical calibration to industry standards. This data item shall be verified with the quantity of raw materials used and sales bills for biodiesel.
D.2.1.3.2.	Medium	Quality control of this data item will not under the control of project participants. Hence, no QA / QC procedures are planned.
D.2.1.3.3	Low	Quality control of this data item will not under the control of project participants. Hence, no QA / QC procedures are planned.
D.2.1.3.4	Medium	Data come from external sources. Hence, no QA / QC procedures are planned.
D.2.1.3.5	Medium	Data come from external sources. Hence, no QA / QC procedures are planned.
D.2.3.1.1	Medium	This data item will be used for estimation of project induced emissions from methanol consumption. Quantity of methanol consumed will be measured using electronic weighing scale installed at the entry of the project premises. Trucks carrying methanol will be weighed twice, once upon entry of loaded truck into the project premises and the second upon exit from the project premises. The difference of these two represents the methanol weight carried inside the project area. This data item will be further verified using purchase bills of the methanol, daily opening stock and closing stock records of the inventory. Electronic weighing scales will be subjected to regular calibration according to the industry standards.

**D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity**

&gt;&gt;

Attached as Annex 4: Monitoring Plan.

**D.5 Name of person/entity determining the monitoring methodology:**

&gt;&gt;

The contact information for the entity that has determined the monitoring methodology is given below.

Organization:	ZENITH CORPORATE SERVICES (P) LTD.
Street/P.O. Box, Building:	10-5-6/B, MYHOME PLAZA, MASABTANK,
City:	HYDERABAD
State/Region:	ANDHRA PRADESH
Postfix/ZIP:	500028
Country:	INDIA
Telephone:	+91-40-2337 6630, 2337 6631
FAX:	+91-40-2332 2517
E-Mail:	<a href="mailto:zenithenergy@sancharnet.in">zenithenergy@sancharnet.in</a>
URL:	<a href="http://www.zenithenergy.com">www.zenithenergy.com</a>
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	Mohan
First Name:	Attipalli

The above party is not included in Annex.1.

**SECTION E. Estimation of GHG emissions by sources****E.1. Estimate of GHG emissions by sources:**

&gt;&gt;

As described in the new baseline methodology, the following greenhouse gas emissions are considered for the project activity within the project boundary.

- a) Emissions from the electricity consumed by the project and oil extraction activities
- b) Off-site transport emissions for transport of biodiesel, raw materials and by-products

Project emissions from fossil fuel consumption of the biodiesel plant and emissions from preparation of lands for new plantations are not applicable for the project activity, since, the project proponents intend to use only biodiesel onsite in boilers.

The above project emissions are calculated using the formulae provided in the new baseline methodology. An illustration of calculation methods is given below.

Emissions from electricity consumption

Approximate electricity requirement for the production of biodiesel is considered as 85 kWh/ton, annual biodiesel production of 8910 tons and the grid emission factor is given as 1.178 kg/kWh. Using this data and the emissions from electricity consumption is computed as follows.

$$\begin{aligned}
 \text{Emissions from electricity} &= \text{electricity consumed} \times \text{grid emission factor} \\
 \text{tCO}_2/\text{yr} &= \text{MWh / yr} \times \text{tCO}_2/\text{MWh} \\
 &= 85 \times 8910 / 1000 \times 1.178 \\
 &= 892 \text{ tCO}_2 / \text{yr}
 \end{aligned}$$

Off-site transportation emissions:

Assuming that the project proponents purchase around 40,000 kg of petro-diesel per year for transportation, and an emission factor of 3125.79 g CO<sub>2</sub> / kg of fuel, transport emissions are computed as follows.

$$\begin{aligned}
 \text{Transport emissions} &= \text{Petro-diesel consumed} \times \text{Emission factor} \\
 (\text{tCO}_2\text{e / yr}) &= (\text{t / yr}) \times (\text{tCO}_2\text{e / t fuel}) \\
 &= 40,000 / 1000 \times 3125.79 / 10^3 \\
 &= 125 \text{ tCO}_2\text{e / yr}
 \end{aligned}$$

Summary of project emissions as estimated for the crediting period are provided below.

Year	2005	2006	2007	2008	2009	2010	2011
Emissions from electricity use, (tCO <sub>2</sub> )	694	892	892	892	892	892	892
Off-site transportation emissions (tCO <sub>2</sub> )	94	125	125	125	125	125	125
Total Project emissions (tCO <sub>2</sub> e)	788	1017	1017	1017	1017	1017	1017

In the above table, first year emissions are reduced because of lower plant load factor of 70%.



**E.2. Estimated leakage:**

&gt;&gt;

As described in the baseline methodology, the project activity results in leakage emissions due to the methanol consumption.

Leakage emissions are estimated as follows.

Emissions from Methanol production

Methane emission factor specified by IPCC is used for estimating methane emissions. The project will consume around 762 tons of methanol during the first year of operation and 980 tons per year from the second year onwards.

$$\begin{array}{rclclclcl}
 \text{Methane Emissions (tCO}_2\text{e)} & = & \text{Methanol consumed by project (t/year)} & \times & \text{Methane Emission factor (tCH}_4\text{ / t of methanol)} & \times & \text{GWP}^4 \text{ of methane (tCO}_2\text{/tCH}_4\text{)} \\
 & = & 762 & \times & 2 \times 10^{-3} & \times & 21 \\
 & = & 32 \text{ tCO}_2\text{e} & & & & 
 \end{array}$$

Summary of the above leakage emissions as estimated for the crediting period is furnished below.

Year	2005	2006	2007	2008	2009	2010	2011
Methane emissions (tCO <sub>2</sub> e)	32	41	41	41	41	41	41
Total leakage emissions (tCO <sub>2</sub> e)	32	41	41	41	41	41	41

**E.3. The sum of E.1 and E.2 representing the project activity emissions:**

&gt;&gt;

The net project emissions from the project activity are given in the table below.

Year	2005	2006	2007	2008	2009	2010	2011
Project Emissions (as per E.1)	788	1017	1017	1017	1017	1017	1017
Leakage (as per E.2)	32	41	41	41	41	41	41
Sum of above E.1. & E.2.	820	1058	1058	1058	1058	1058	1058

**E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:**

&gt;&gt;

As described in the new baseline methodology, baseline emissions represent emissions from petro-diesel substituted in the baseline. Baseline emissions are calculated using the formulae provided in the new baseline methodology as follows. Biodiesel consumed is assumed as 8910 tons per year from second year onwards. However, this data will be monitored ex post for estimation of actual baseline emissions. National CO<sub>2</sub>e emission factor is computed as given below.

---

<sup>4</sup> GWP: Global Warming Potential



$$\begin{aligned}
 \text{Baseline CO}_2 \text{ Emissions} &= \text{Carbon content in petro-diesel} \times \text{Oxidisation factor} \times \text{Conversion factor} \\
 (t\text{CO}_2 / t \text{ fuel}) &= (tC / t \text{ fuel}) \times (\%) \times (t\text{CO}_2 / tC) \\
 &= 0.8611 \times 99\% \times 44/12 \\
 &= 3.1257 t\text{CO}_2 / t \text{ fuel}
 \end{aligned}$$

Baseline emissions are computed as follows, considering the biodiesel consumption of 8,910 t/year from the second year onwards.

$$\begin{aligned}
 \text{Baseline emissions (tCO}_2\text{e/year)} &= \text{Biodiesel consumed (t/year)} \times \text{Emission factor (tCO}_2\text{e/t fuel)} \times \text{Efficiency multiplier} \\
 &= 8,910 \times 3125.7 \times 10^{-3} \times 1.0 \\
 &= 27,851 t\text{CO}_2\text{e/year}
 \end{aligned}$$

In the above formula, efficiency multiplier is assumed as 1.0, since, the project activity is first of its kind in India and only biodiesel blends containing less than 20% biodiesel in petro-diesel is anticipated which will not have significant influence on vehicle engine efficiency. However, this will be modified in the final PDD based on the publicly available information and monitored expost during the project operation.

Likewise, baseline emissions are calculated for each year in the crediting period. The following table provides baseline emissions during the crediting period.

Year	2005	2006	2007	2008	2009	2010	2011
Baseline emissions, tCO <sub>2</sub> e	21,662	27,851	27,851	27,851	27,851	27,851	27,851

In the above table, the first year 2005 represents 12 month period starting from the date of project operation. Likewise subsequent years represent 12 month periods.

#### **E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:**

>>

The difference between E.4 and E.3, representing the emission reductions of the project activity, is provided in the following table.

Year	2005	2006	2007	2008	2009	2010	2011
Baseline emissions, tCO <sub>2</sub> , <b>E4</b>	21,662	27,851	27,851	27,851	27,851	27,851	27,851
Project emissions, tCO <sub>2</sub> , <b>E3</b>	820	1058	1058	1058	1058	1058	1058
Emission reductions, tCO <sub>2</sub>	20,842	26,792	26,792	26,792	26,792	26,792	26,792

#### **E.6. Table providing values obtained when applying formulae above:**

>>

Values obtained when applying the formulae are provided in the previous section (Under E1, E2, E3, E4 and E5).

**SECTION F. Environmental impacts****F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:**

&gt;&gt;

Since, the project capacity and investment is very small, environmental impact assessment is not necessary as per the official guidelines by the Ministry of Environment & Forests. Hence, the same is not carried out by the project proponents. However, the project activity does not result in any negative impacts on the environment. The project activity results in a small quantity of water effluents, which will be treated in an effluent treatment plant being installed within the project premises. The treated effluents will be utilised for dust suppression or recycled or utilised for green belt development.

**F.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:**

&gt;&gt;

No significant environmental impacts are considered.

**SECTION G. Stakeholders' comments**

&gt;&gt;

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

&gt;&gt;

Attached as Annex 6: Stakeholders comments.

**G.2. Summary of the comments received:**

&gt;&gt;

No comments on the project have been received.

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

&gt;&gt;

No comments received; hence, no actions are applicable.

Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	SOUTHERN ONLINE BIO TECHNOLOGIES LTD.
Street/P.O.Box:	
Building:	Flat No.A3, 3 <sup>rd</sup> Floor, Office Block, Samrat Complex, Saifabad
City:	Hyderabad
State/Region:	Andhra Pradesh
Postfix/ZIP:	500038
Country:	India
Telephone:	+91-40-2324 1999, 3330 2349
FAX:	+91-40-2324 1444
E-Mail:	<a href="mailto:biofe@sol.net.in">biofe@sol.net.in</a>
URL:	<a href="http://www.biofe.com">www.biofe.com</a>
Represented by:	
Title:	DIRECTOR
Salutation:	MR.
Last Name:	NANUBALA
Middle Name:	KUMAR
First Name:	SATISH
Department:	
Mobile:	+91-98490 02349
Direct FAX:	
Direct tel:	
Personal E-Mail:	<a href="mailto:satish@sol.net.in">satish@sol.net.in</a>



Annex 2

**INFORMATION REGARDING PUBLIC FUNDING**

No public funding is involved in the project activity.

Annex 3

**BASELINE INFORMATION**

**Transport emission factors**

Carbon content of petro-diesel : 86.11%

Oxidisation factor : 1%

Source: CO<sub>2</sub> mitigation and the Indian transport sector.

Grid emission factor for the electricity consumed : 1.178 kg/kWh (For southern region)

Source : Baselines for renewable energy projects by Ministry of Non-conventional Energy Sources

Methanol emission factor : 2 g/kg of methanol production for estimating project induced emissions outside the project boundary.

Source : Table 2-10, Revised IPCC Guidelines for National Greenhouse Gas Inventories : Reference Manual

Annex 4**MONITORING PLAN**

This monitoring plan is designed for the 30 TPD Biodiesel production plant in Andhra Pradesh in India. The monitoring plan, which will be implemented by the project proponents right from the start of the project activity, describes about the monitoring organisation, parameters and variables to be monitored, monitoring practices, QA and QC procedures, data storage and archiving etc. This monitoring methodology will be subjected to final revision depending on the requirements, before submitting for registration of the project.

**MONITORING ORGANISATION**

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the Board of Directors who may delegate the same to a competent person identified for the purpose. The identified person, in the rank of General Manager, will be the incharge of the GHG monitoring activities within project's functioning. The General Manager will be assisted by a team of experienced personnel in disciplines such as mechanical and electrical with experience in plant operation, measurements and management. The primary responsibility of the team is to measure, monitor, record and report the information on various data items to the General Manager, in accordance with the applicable standards. Periodic calibration of various instruments used in the monitoring of GHG related data and record keeping of the same also will be the responsibility of the team.

The responsibility of review, storage and archiving of information in good condition lies with the General Manager. General Manager will undertake periodic verifications and onsite inspections to ensure the quality of the data collected by the team and initiate steps in case of any abnormal conditions which are not foreseen in the baseline or monitoring methodologies. The General Manager will review the data collected by the team with reference to the criteria determined in the monitoring methodology and suggest corrective actions wherever required. An internal GHG audit report will be prepared for review by the Board of Directors which will be later submitted for verification by an independent entity (DOE). Board of directors will examine the internal audit reports and will in particular take note of any deviations in data over the norms and monitor that the corrective actions have resulted in adherence to the standards.

The team including the General Manager will be constituted by the Board of Directors, in advance before the start of the project operations. The General Manager will report to the board of directors and seek guidance in case of conflicts or difficulties in order to maintain the monitoring organisation in good spirit.

The Board of Directors of the company may introduce an internal audit system for the GHG compliance. The internal auditor appointed for the purpose will be an individual with necessary experience exclusively in GHG audits. The person so appointed as an internal auditor will be given clear instructions about his scope of work and reporting requirements. He will carry out his work on monthly basis or as required by the monitoring plan. His report will indicate the compliance requirements and achievements. He will work directly under the control of the Board of Directors and all his reports will be addressed to the Board directly. The internal auditor in particular will report to the management any non-compliance of corrective actions by the operating staff.



## PARAMETERS REQUIRING MONITORING

As detailed in the project design document under Section – D, the following parameters / variables will be monitored under this monitoring protocol.

Project Emissions : As described in the PDD, the following project emissions will be monitored by the team.

- a) Electricity consumed by the biodiesel production plant during plant operation and oil extraction activities
- b) Fossil fuels consumed on site
- c) Fossil fuel emission factors
- d) Petro-diesel consumed for off-site transport of raw materials, by products and biodiesel to filling stations

Leakage : As described in the PDD, the following leakage emissions will be monitored by the team.

- a) Emissions associated with manufacture of methanol for biodiesel production

Baseline : The following parameters / variables are to be monitored under this monitoring plan.

- a) Emission factors for each greenhouse gas as applicable
- b) Quantity of biodiesel produced in the plant
- c) Quantity of biodiesel consumed by vehicles
- d) Grid emission factor
- e) Efficiency multiplier
- f) Oxidisation factor

Description of each data item is furnished in the Project Design Document.

## QA AND QC PROCEDURES

The project employs latest state of art microprocessor based high accuracy monitoring and control equipment that will measure, record, report, monitor and control of various key parameters like biodiesel produced by the project, electricity consumed, quantities of feedstocks used, quality of the biodiesel etc. These monitoring and controls will be the part of the Distributed Control System (DCS) of the entire plant which will be decided during implementation of the project. Necessary standby meters or check meters as required will be installed, to operate in standby mode when the main meters are not working. All meters will be calibrated and sealed as per the industry practices at regular intervals. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters. Sales records will be used and kept for checking the consistency of the recorded data.

Data for other parameters such as emission factors etc. will be obtained from the official statistics. Hence, quality control is not under the control of the project proponents. However, the obtained data will be properly monitored, recorded and kept for verification.



## DATA STORAGE AND ARCHIVING

All the data items monitored under the monitoring plan will be kept for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later.

The monitored data will be presented to an independent verification agency or DOE to whom verification of emission reductions is assigned.

Necessary formats / tables / log sheets etc. will be developed by the project proponents for monitoring and recording of the data and will be made part of the registered monitoring protocol.



Annex 5

Estimate of emission reductions due to the project

<b><u>ESTIMATION OF EMISSIONS REDUCTIONS FROM BIO-DIESEL</u></b>								
<b><u>ZENITH CORPORATE SERVICES (P) LTD.</u></b>								
DATE : 25.10.2004								
CLIENT : SOUTHERN ONLINE BIOTECHNOLOGIES LTD.								
PROJECT : 30 TPD BIODIESEL PLANT IN AP, INDIA.								
Year		2005	2006	2007	2008	2009	2010	2011
<b><u>BASELINE EMISSIONS</u></b>								
Production capacity	t / year	6930	8910	8910	8910	8910	8910	8910
CO <sub>2</sub> e emission coefficient	g/kg fuel	3125.79	3125.79	3125.79	3125.79	3125.79	3125.79	3125.79
Baseline emissions	tCO <sub>2</sub> e	21662	27851	27851	27851	27851	27851	27851
<b><u>PROJECT EMISSIONS</u></b>								
<i>From electricity usage</i>								
Electricity consumption rate	kWh / t	85	85	85	85	85	85	85
grid emission factor for AP	kgCO <sub>2</sub> /kWh	1.178	1.178	1.178	1.178	1.178	1.178	1.178
CO <sub>2</sub> emissions	tCO <sub>2</sub>	694	892	892	892	892	892	892
<i>From transportation of materials</i>								
Petro-diesel considered	kg / year	30000	40000	40000	40000	40000	40000	40000
CO <sub>2</sub> Emission factor	g/kg fuel	3125.79	3125.79	3125.79	3125.79	3125.79	3125.79	3125.79
CO <sub>2</sub> emissions	tCO <sub>2</sub> e	94	125	125	125	125	125	125
<b>Total project emissions</b>	tCO <sub>2</sub> e	788	1017	1017	1017	1017	1017	1017
<b><u>LEAKAGE</u></b>								
Methanol used	t/year	762	980	980	980	980	980	980
Methane emission factor	g/kg	2	2	2	2	2	2	2
Methane emissions	tCH <sub>4</sub>	1.5	2.0	2.0	2.0	2.0	2.0	2.0
CO <sub>2</sub> equivalent emissions	tCO <sub>2</sub> e	32	41	41	41	41	41	41
<b>Total leakage emissions</b>	tCO <sub>2</sub> e	32	41	41	41	41	41	41
Emissions reductions	tCO <sub>2</sub>	20842	26792	26792	26792	26792	26792	26792
Total CERs	tCO <sub>2</sub> e	181,597	For 7 years					

Annex 6**Stakeholder Comments****IDENTIFICATION OF STAKEHOLDERS**

The following stakeholders are identified for the project activity.

1. Local populace, which is represented by the Village Panchayat. The Panchayat is an elected body of representatives administering the local area. To set up any project, project proponents need to obtain No-Objection Certificate from the Panchayat and permission to set up the project within the village.
2. Department of Industries, Govt. of Andhra Pradesh. Project participants shall obtain license for implementing and operating the project. Project proponents need to approach this department for necessary license before setting up the project.
3. Andhra Pradesh Pollution Control Board. APPCB is responsible for issuing Clearance certificate for setting up any project in the state of Andhra Pradesh. Project proponents need to approach APPCB prior to setting up a project and obtain consent to start construction activities.
4. Ministry of Rural Development, Govt. of India. MoRD is the nodal agency to promote biofuel projects in the country. Project proponents need to approach MoRD and shall look for support for setting up the biofuel project.
5. Ministry of Environment & Forests, Govt. of India. MoEF is designated as the National Authority for CDM in India. Project participants need to submit complete documentation to MoEF for obtaining host country approval, in case they are willing to avail CDM status for the project activity.

Apart from the above, no other stakeholders are identified for the project activity.

**STAKEHOLDER CONSULTATION PROCESS**

Project participants have published a public notice in local newspapers in English and Telugu languages (Local language) in the month of January 2004, inviting public comments on the project. The notice indicates the project description and location of the project. The public notice is published in the entire district region where the project is proposed. Apart from the public notice, the project promoters also gave wide publicity in print media to project activity to bring awareness on the project.

Following the public notice, a public meeting was convened by the project proponents in the village where the project is proposed. The purpose of the public notice and meeting was to inform all the stakeholders, invite comments / objections on the project and participate in the stakeholder meeting.

Several local farmers, head of the village panchayat, village administrative officers, local Member of Legislative Assembly of Andhra Pradesh, Officials from other stakeholders, Non-governmental Organisations, unemployed youth etc. attended the public meeting. Project details were briefed at the meeting and invited objections / comments about the project.



Apart from the public meeting, other stakeholders listed above were directly approached by the project proponents for their comments and submitted complete information about the project activity.

### STAKEHOLDERS' COMMENTS

Public comments received during the stakeholders meeting have been very supportive and no negative comments / objections were received. In fact the local people welcomed the project.

Further, several NGOs, community organisations and academics have written to project proponents offering support and seeking help in setting up similar small scale biodiesel plants in their communities.

All other stakeholders i.e. DoI – GoAP, APPCB, MoRD – GoI have already issued their clearances / consent letters to the project proponents.

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