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

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

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

Version No. : 02

Date : 06/01/2006

A.2. Description of the project activity:

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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.

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 21st year of operation of the project or during 2025.

In addition, more than 1000 hectares of wastelands[1] 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 5th 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.

[1] 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_2 is emitted as was sequestered. Thus, the proposed project leads to "No net addition of CO_2 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 Sermi Arid Tropics). Results[2] 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_2 emissions for global GHG mitigation

[2] 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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Name of Party involved ((host) indicates a host party	Private and/or public entity(ies) project participants (as aplicable)	Kindly indicate if the Party involved wishes to be considered as project participate (Yes/No)
India (Host)	Private Entity: M/s Southern Online Bio Technologies Ltd.	No

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.:

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Andhra Pradesh

A.4.1.3. City/Town/Community etc:

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Samsthan Narayanapur Village, Nalgonda Dist.

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 the following two categories (sectoral scopes)

Scope 1 : Energy Industries (renewable / non-renewable soures)
Scope 7 : Transport

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

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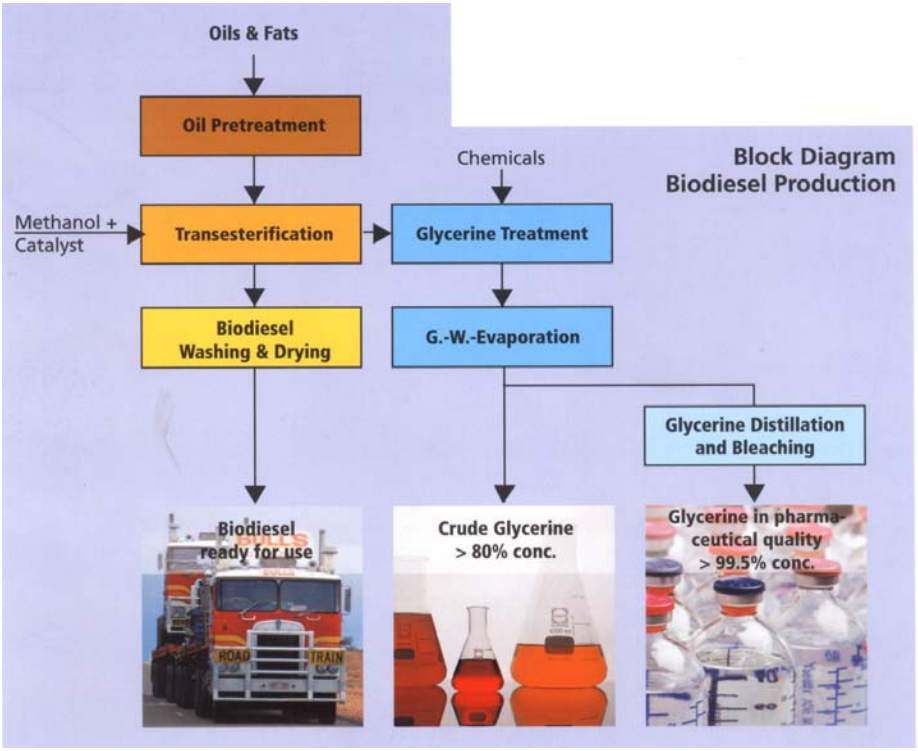
Technology Description

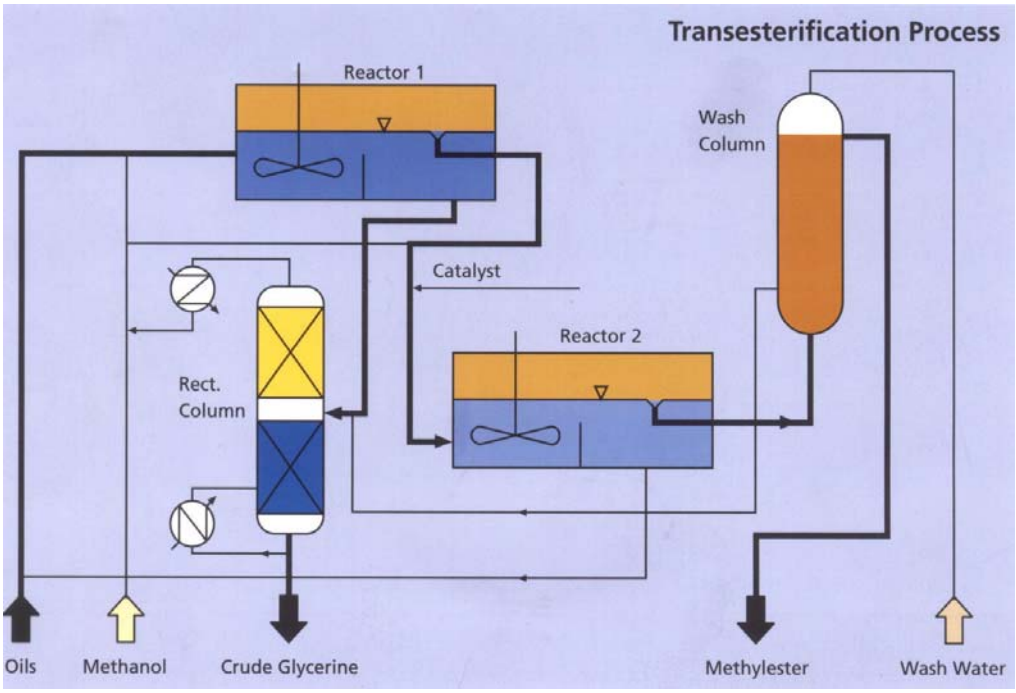
The technology of biodiesel manufacturing involves pre-treatment of raw oils, acid oils / fats, esterification / trans-esterification using Methanol / Ethanol and chemical catalysts and then finally washing and drying to obtain the bio-diesel. Block diagrams showing the proposed process are furnished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

$$RCOOH + R'OH \longrightarrow RCOOR' + H_2O$$

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_2), methane (CH_4) and nitrous oxide (N_2O). 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_2 emission factor for petro-diesel, the project will avoid GHG emissions of around 27,851 tons CO_2 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_2e emissions every year and generates around 26,798 CO_2 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	Annual estimation of emission reductions in tonnes of CO_2e
2006	20851
2007	26798
2008	26798
2009	26798
2010	26798
2011	26798
2012	26798
Total estimated reductions (tonnes of CO_2e)	181639
Total number of crediting years	Seven (7) Years
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	25948

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.

"Production of biodiesel from perennial non-edible oil crops for use as fuel"

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.

1. Biodiesel plant:
   a) The project activity involves construction and operation of a biodiesel plant for (trans-) esterification of biogenic oils and fats, using alcohols such as methanol or ethanol.
   b) The biodiesel plant includes an expeller for production of oils from seeds, and / or it processes oils expelled elsewhere.
   c) Storage and treatment of feedstocks and products of the plant do not result in any methane emissions.

2. Consumers:
   a) The biodiesel is supplied to identified consumers, and / or to identified retailers for on-sale to unidentified consumers.
   b) For biodiesel supplied to identified consumers for use as a transport fuel and/or as stationery combustion fuel. The biodiesel may be consumed pure (B100) or as a blend with petrodiesel (e.g. B5, B10, etc.) and the blending proportion is low enough to ensure that the price and technical performance characteristics of the blend do not differ significantly from those of pure petrodiesel. The default value for the maximum allowable blending proportion for this purpose is 10% by volume (B10). Blending is done by the project participant or a third party who is contractually bound to the producer (e.g., the retailer), to ensure that blending proportions can be verified.
   c) Export of the biodiesel to another country is not envisaged. The identified consumers operate in the host country are contractually obliged to consume the biodiesel in the host country only and similarly, retailers are contractually obliged to sell the biodiesel blend in the host country.

3. Crops:
   a) The plant processes mainly oils and seeds from non-edible, perennial crops such as *Pongamia pinnata* and *Jatropha curcas*.
   b) The oil seeds are either acquired from identified contracted farmers, or from unidentified sources via traders, or a combination thereof.
   c) There is sufficient information publicly available to determine in a conservative way, for the region from which the plant procures its feedstock:
      - Whether the processed crops are available in surplus; and
      - Whether use of the crops for biodiesel production is likely to displace any existing uses; and
      - Whether the processed crops are the most economically attractive cultivation option on fertile (= non-degraded) agricultural lands.
   d) Nitrogen (N) inputs into plantations of each processed oil crop will be monitored
   e) Annual and edible crops, such as sunflower and soybean will not be processed.

4. CER Ownership:
   a) Project participants claim CERs only for the direct CO_2 emissions from fossil fuels displaced by the biodiesel. They do not claim CERs for the following: (i) Biodiesel consumed for non-energy purposes; (ii) Reductions in life-cycle emissions associated with the production of the displaced fossil fuels; and (ii) Utilization of the by-products of biodiesel production, such as glycerol and de-oiled seed cake.
   b) Project participants have contractually arranged with their identified biodiesel consumers and retailers that the latter will not claim CERs for the displaced fossil fuels.
   c) Where the biodiesel plant uses alcohols derived from biomass for esterification, project participants prove that the producer of the alcohol does not claim CERs.

Hence, the baseline methodology suits the proposed project activity.

B.2. Description of how the methodology is applied in the context of the project activity:

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The proposed methodology is applicable to project activities involving construction and operation of a plant for production of biodiesel from non-edible, perennial oil crops. CERs accrue for the displacement of fossil fuels in mobile and stationary applications. The biodiesel will be supplied to identified (large) consumers, or to unidentified consumers via identified retailers.

The baseline emissions include the CO_2 from the combustion of the fuel(s) that would most likely be used in the baseline scenario. Project emissions include CO_2 from fuels and grid electricity consumed for the operation of the biodiesel plant, plus CO_2 from any fossilized carbon which the biodiesel may contain if fossil-fuel based alcohols are used for transesterification.

The project participants quantified increases in emissions outside the project boundary due to (i) production of alcohols consumed for transesterification, (ii) emissions due to enhanced cycles of nitrogen (N) in crop plantations, and (iii) decreases in emissions related to avoided production of fossil fuels. Project participants quantified leakages of type (ii) and (iii) by applying a combined default correction factor of 15% of the baseline emissions.

The project participants envisaged planting oil crops only on severely degraded lands, wastelands, and marginal lands along roads, railroads and field boundaries, as well as crops collected from wild trees bearing oil seeds. The proposed oil crops are not the most economically attractive cultivation option on land of normal fertility. No initial clearing of the degraded lands is required.

Double-counting of emission reductions between the producer and consumers of the biodiesel is prevented through contractual arrangements. Likewise, double-counting of CERs between the supplier of the alcohol and the biodiesel producer is prevented.

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 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[3]. 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 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 Ist 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.

[3] Sectoral economic costs and benefits of GHG mitigation, by Ranjan K Bose.

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.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:

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The baseline methodology applied for the project activity proposed to demonstrate the additionality using the latest version of the consolidated tool agreed by the Executive Board. The consolidated tool on additionality is a step by step approach which is applied to the project activity as follows.

Step 1: Identification of lawful alternatives to the project

The project activity has three 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.
c) Petro-diesel substitution with CNG, LNG or LPG

All the above alternatives identified 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.

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.

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 king 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:

>>

The spatial extent of the project boundary includes

a) The biodiesel production plant site comprising the esterification unit, plus expeller unit and other installations on the site
b) Upstream expeller plants supplying oil to the biodiesel production plant
c) Vehicles and stationery combustion installations where the biodiesel is consumed.

Relevant emission sources within this boundary include (see table below for details):
- Fuel and electricity consumed at the biodiesel plant;
- Electricity consumed by upstream expellers;
- Emissions from combustion of the biodiesel.

Emissions associated with the cultivation of the oil crops are excluded for the project boundary, but accounted for as leakage.

The following processes are excluded from the project boundary:
- Transports of feedstocks to the biodiesel plant, and of biodiesel to consumers / retailers;
- Emissions from preparation of other inputs for the biodiesel plant (e.g., emissions from production of methanol);
- Treatment of by-products of the biodiesel plant (Glycerol, seed cake).

	Source	Gas	Included?	Justification / Explanation
Baseline	Vehicles & stationary combustion installations consuming biodiesel	CO_2	Yes	Main source of baseline emissions
Project Activity	Biodiesel plant energy consumption	CO_2	Yes	On-site fuel consumption plus production of grid electricity
	Upstream expeller	CO_2	Yes	Electricity consumption included, using default value
	Vehicles & stationary combustion installations consuming biodiesel	CO_2	Yes	Fossil carbon contained in alcohols used for esterification. Other biodiesel carbon is climate-neutral (renewable biomass).

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:

>>
Detailed baseline information is attached in Annex 3.

Date of completion of the baseline : 0**6/01/2006**

Baseline methodology developed by Factor Consulting + Management AG (Urs Brodmann) with contributions from Perspectives Climate Change (Axel Michaelowa)

The above entities are not included as project participants 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:

>>
01/09/2005

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

>>
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:

>>
01/04/2006

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

Not Applicable

C.2.2.1. Starting date:

>>Not Applicable

C.2.2.2. Length:

>>Not Applicable

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

>>
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.

"Production of biodiesel from perennial non-edible oil crops for use as fuel"

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

>>
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.

1. Biodiesel plant:
   a) The project activity involves construction and operation of a biodiesel plant for (trans-) esterification of biogenic oils and fats, using alcohols such as methanol or ethanol.
   b) The biodiesel plant includes an expeller for production of oils from seeds, and / or it processes oils expelled elsewhere.
   c) Storage and treatment of feedstocks and products of the plant do not result in any methane emissions.

2. Consumers:
   a) The biodiesel is supplied to identified consumers, and / or to identified retailers for on-sale to unidentified consumers.
   b) For biodiesel supplied to identified consumers for use as a transport fuel and/or as stationery combustion fuel. The biodiesel may be consumed pure (B100) or as a blend with petrodiesel (e.g. B5, B10, etc.) and the blending proportion is low enough to ensure that the price and technical performance characteristics of the blend do not differ significantly from those of pure petrodiesel. The default value for the maximum allowable blending proportion for this purpose is 10% by volume (B10). Blending is done by the project participant or a third party who is contractually bound to the producer (e.g., the retailer), to ensure that blending proportions can be verified.
   c) Export of the biodiesel to another country is not envisaged. The identified consumers operate in the host country are contractually obliged to consume the biodiesel in the host country only and similarly, retailers are contractually obliged to sell the biodiesel blend in the host country.

3. Crops:
   a) The plant processes mainly oils and seeds from non-edible, perennial crops such as *Pongamia pinnata* and *Jatropha curcas*.
   b) The oil seeds are either acquired from identified contracted farmers, or from unidentified sources via traders, or a combination thereof.
   c) There is sufficient information publicly available to determine in a conservative way, for the region from which the plant procures its feedstock:
      - Whether the processed crops are available in surplus; and
      - Whether use of the crops for biodiesel production is likely to displace any existing uses; and
      - Whether the processed crops are the most economically attractive cultivation option on fertile (= non-degraded) agricultural lands.
   d) Nitrogen (N) inputs into plantations of each processed oil crop will be monitored
   e) Annual and edible crops, such as sunflower and soybean will not be processed.

4. CER Ownership:
   a) Project participants claim CERs only for the direct CO_2 emissions from fossil fuels displaced by the biodiesel. They do not claim CERs for the following: (i) Biodiesel consumed for non-energy purposes; (ii) Reductions in life-cycle emissions associated with the production of the displaced fossil fuels; and (ii) Utilization of the by-products of biodiesel production, such as glycerol and de-oiled seed cake.
   b) Project participants have contractually arranged with their identified biodiesel consumers and retailers that the latter will not claim CERs for the displaced fossil fuels.
   c) Where the biodiesel plant uses alcohols derived from biomass for esterification, project participants prove that the producer of the alcohol does not claim CERs.

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
2.1.1	$M_{P\_fuel\_expel\_i\_y}$ *Fuel consumption for on-site expeller*	*Plant records (purchase data)*	*t*	*m*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	*Index i denotes different fuels.*
2.1.2	$M_{P\_fuel\_other\_i\_y}$ *Fuel consumption other than for on-site expeller*	*Plant records (purchase data)*	*t*	*m*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	*Index i denotes different fuels.*
2.1.3	EF_i *Carbon content of fuel*	*Fuel supplier or default values*	*t C /t fuel*	*e*	*Once for each fuel i*	*0%*	*E* Data needs to be kept until two years after end of the crediting period.	*Default values may be derived from IPCC data,[4] or from national statistics if available.*
2.1.4	$Q_{P\_elec\_expel\_y}$ *Electricity consumption for expeller*	*Plant records (electricity*	*MWh*	*m*	*annually*	*100%*	*E* Data needs to be kept until	--

[4] See IPCC 1996 Revised Guidelines for National Greenhouse Gas Inventories, Reference Manual, p.1.13

		meter)					two years after end of the crediting period.	
2.15	$M_{Oil\_ester\_y}$ *Amount of oil esterified*	*Plant records*	*t*	*m or c*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	*This is the sum of oil purchased and oil expelled on site. May be calculated from biodiesel output* $M_{BD\_i\_y}$
2.16	$M_{Oil\_purchase\_y}$ *Amount of oil purchased*	*Plant records (purchase data)*	*t*	*m*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	--
2.1.7	$M_{Oil\_expel\_y}$ *Amount of oil expelled on-site*	*Plant records*	*t*	*m or c*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	*Measured by weighing, or calculated as the difference of* $M_{Oil\_ester\_y}$ *and* $M_{Oil\_purchase\_y}$
2.18	$Q_{P\_elec\_other\_y}$ *Electricity consumption other than for expeller*	*Plant records (electricity meter)*	*MWh*	*m*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	--
2.1.9	EF_{Elec} *Emission factor for grid electricity*	*Grid supplier data*	*t* CO_2*/MWh*	*c*	*Once or annually*	*100%*	*E* Data needs to be kept until two years after end of the	*Determined in accordance with ACM002 or AMS 1.D*

							crediting period.	
2.1.10	$M_{Alc\_i\_y}$ *Alcohol consumed*	*Plant record (purchase data)*	*t*	*m*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	*Index i denotes different types of alcohol.*
2.1.11	EF_{Alc_i} *Fossil carbon content of alcohol*	*Supplier data*	*t C/t*	*c*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Project activity emissions include three components: CO_2 from consumption of fuels and electricity in the biodiesel plant, and CO_2 emissions from combustion of fossil carbon contained in the alcohols which is chemically bound in the biodiesel during the esterification process, and released upon combustion. The remaining CO_2 emissions resulting from the combustion of the biodiesel are considered climate-neutral.

(1) $$E_{P\_y} = E_{P\_fuel\_y} + E_{P\_elec\_y} + E_{P\_alc\_y}$$

where:

E_{P_y} *Project activity emissions in year y (t CO_2)*
$E_{P\_fuel\_y}$ *Emissions from combustion of fuels in the biodiesel plant (t CO_2)*
$E_{P\_elec\_y}$ *Emissions from electricity consumption in the biodiesel plant (t CO_2)*
$E_{P\_alc\_y}$ *Emissions from combustion of fossil carbon contained in biodiesel ester alcohols (t CO_2)*

Ep_y are not considered since no fossil fuels are envisaged by the project participants. Hence, the same is considered as Zero in the above formula.

(2) $$E_{P\_elec\_y} = (Q_{p\_elec\_expel\_y} \cdot \frac{M_{Oil\_ester\_y}}{M_{Oil\_expel\_y}} + Q_{P\_elec\_other\_y}) \cdot EF_{Elec}$$

$$(3) \qquad E_{P\_alc\_y} = \sum_i M_{Alc\_i\_y} \cdot EF_{Alc\_i} \cdot 44/12$$

The emission factor EF_{Elec} shall be calculated in accordance with the latest version of the AMS 1.D.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and 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
2.3.1	$M_{BD\_i\_y}$ *Biodiesel supplied to consumers*	*Plant records (scale / sales data)*	*t*	*m*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	*Index i denotes different baseline fuels.*
2.3.2	NCV_{BD} *Net calorific value of biodiesel*	*Lab analysis*	*GJ /t biodiesel*	*m*	*once at project start, or when new biodiesel type is introduced*	*Representative sample*	*E* Data needs to be kept until two years after end of the crediting period.	*Determined separately for biodiesel from each different oil crop.*

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Baseline emissions from displaced fossil fuels are determined for each baseline fuel i using the following equations:

$$(4) \qquad E_{BL\_y} = \sum_i M_{BD\_i\_y} \cdot efm\_m_i \cdot EF_i \cdot 44/12$$

where:

E_{BL_y} *Baseline emissions in year y (t CO_2)*
$M_{BD\_i\_y}$ *Amount of biodiesel (pure, i.e. before blending) substituting baseline fuel type i (t)*
efm_m_i *Efficiency multiplier (mass basis) for baseline fuel i vs. biodiesel (kg/kg)*
EF_i *Carbon content of baseline fuel i (t C /t fuel)*
44/12 *Molar weight ratio to convert tonnes of carbon to tonnes of CO_2*

The carbon contents of the baseline fuels EF_i should be based on either national statistics or IPCC default values.[5]

For blends of biodiesel with petrodiesel, and generally whenever the baseline fuel is petrodiesel, the efficiency multiplier efm_m_i shall be calculated based on the respective net calorific values of biodiesel and petrodiesel, as shown in Equation (5):

(5) $$efm\_m_i = \frac{NCV_{BD}}{NCV_{PD}}$$

where:

NCV_{PD} *Net calorific value of petrodiesel (GJ/t), determined from national statistics at start of project activity*

If the baseline fuel is different from petrodiesel (only allowed for pure biodiesel used as transport fuel by identified consumers), the efficiency multiplier shall be calculated based on the specific fuel consumptions in the baseline scenario and the project activity scenario, as shown in Equation (6). The specific consumption of the baseline fuel s_{BL} shall be defined at the start of the project activity, based on historic data on fuel consumption and mileage covering at least 3 years prior to the start of the project activity (or prior to the date when the respective consumer first starts using the biodiesel). The historic consumption data must be representative for the type of vehicles and traffic conditions where the biodiesel will be used. If adequate historic consumption data are not available, vehicle manufacturer data shall be used.

(6) $$efm\_m_i = \frac{s_{BL\_fuel\_i}}{s_{BD}}$$

where:

s_{BL} *Specific consumption of baseline fuel i (kg fuel /vehicle-km)*

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

[5] See Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Reference Manual, p.1.13

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
							Data needs to be kept until two years after end of the crediting period.	
							Data needs to be kept until two years after end of the crediting period.	

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

>>

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
4.1.1	M_{MeOH_y} *Consumption of methanol*	*Plant records (purchase data)*	*t*	*m*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	--
4.1.2	$M_{Oil\_ester\_i\_y}$ *Oil from crop i esterified*	*Plant records (purchase data)*	*t*	*M*	*annually*	*100%*	*E* Data needs to be kept until two years after end of the crediting period.	--
4.1.3	Y_{i_y} *Specific oil yield for crop i*	*Farmer records*	*t oil /ha.yr*	*M*	*annually*	*representative sample***	*E* Data needs to be kept until two years after end of the crediting period.	*Index i denotes different oil crops.*
4.1.4	$m_{ON\_i\_y}$ *Organic manure N applied to crop i*	*Farmer records*	*kg N /ha.yr*	*M*	*annually*	*representative sample***	*E* Data needs to be kept until two years after end of the crediting	*Index i denotes different oil crops. Excludes residues from the oil crop.*

							period.	
4.1.5	$m_{SN\_i\_y}$ *Synthetic fertilizer N applied to crop i*	*Farmer records*	*kg N /ha.yr*	*M*	*annually*	*representative sample***	*E* Data needs to be kept until two years after end of the crediting period.	*Index i denotes different oil crops.*
4.1.6	$m_{RNEX\_i\_y}$ *Residue N from crop i exported as fertilizer*	*Farmer records*	*kg N /ha.yr*	*M*	*annually*	*representative sample***	*E* Data needs to be kept until two years after end of the crediting period.	*Index i denotes different oil crops.*
4.1.7	$m_{RN\_i\_y}$ *Amount of residue N that is returned to any soil*	*Farmer records*	*kg N /ha.yr*	*M*	*annually*	*representative sample***	*E* Data needs to be kept until two years after end of the crediting period.	*Index i denotes different oil crops. Excludes leaves shed by deciduous oil trees.*

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Leakage calculations cover leakage from production of methanol:

(7) $$L_Y = L_{MeOH\_y} + L_{Crop\_net\_y}$$

where:

L_y *Total leakage from the project activity (t CO_2e)*
L_{MeOH_y} *Leakage from production of alcohols consumed by the biodiesel plant (t CO_2e)*
$L_{Crop\_net\_y}$ *Net leakage from production of oil crops (t CO_2e)*

(8) $$L_{MeOH\_y} = M_{MeOH\_y} \cdot EF_{MeOH\_PC}$$

where:
EF_{MeOH_PC} *Precombustion emission factor for methanol production (t CO_2 /t methanol, see baseline methodology for default value)*

Net crop leakage is applicable to the project activity hence, no formulae is applicable.

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_2 equ.)

>>
Emission reductions are calculated from the baseline emissions, the project emissions and leakage, and adjusted for the following:

- Fraction of biodiesel which is produced from ineligible crops; and
- Fraction of biodiesel which is exported to other countries, or which does not comply with the applicability conditions (e.g., wrong blending proportion).

(9) $$ER_y = (E_{BL\_y} - E_{P\_y} - L_y) \cdot (1 - f_{BD\_iec\_y}) \cdot (1 - f_{BD\_ex\_y})$$

where:
ER_y *Emission reductions from the project activity (t CO_2)*
$f_{BD\_iec\_y}$ *Fraction of biodiesel that is produced from ineligible crops (--)*
$f_{BD\_ex\_y}$ *Fraction of biodiesel that is exported abroad (--)*

(10) $$f_{BD\_iec\_y} = \frac{\sum_i M_{BD\_iec\_i\_y}}{M_{BD\_y}}$$

where
$M_{BD\_iec\_i\_y}$ *Amount of biodiesel produced from ineligible crop i (t)*
M_{BD_y} *Total amount of biodiesel produced (t)*

(11) $$f_{BD\_ex\_y} = \frac{M_{BD\_ex\_y}}{M_{BD\_y}}$$

where:
$M_{BD\_ex\_y}$ *Total amount of biodiesel exported abroad (t)*

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
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.
2.1.1 $M_{P\_fuel\_expel\_i\_y}$	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.2 $M_{P\_fuel\_other\_i\_y}$	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.3 EF_i	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.4 $Q_{P\_elec\_expel\_y}$	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.5 $M_{Oil\_ester\_y}$	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.6 $M_{Oil\_purchase\_y}$	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.7 $M_{Oil\_expel\_y}$	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.8 $Q_{P\_elec\_other\_y}$	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.9 EF_{Elec}	*Low*	*No specific QA/QC procedures, since small impact on total CER volume*
2.1.10 $M_{Alc\_i\_y}$	*Low*	*Purchase records must cover full amount of alcohol consumed. Cross check with calculated stochiometric alcohol requirements.*
2.1.11 EF_{Alc}	*Low*	*Alcohols must meet the criteria specified in the baseline methodology to qualify as renewable (i.e.* EF_{Alc} *=0). Purchase records must be verifiable.*
2.3.1 $M_{BD\_i\_y}$	*Low*	*Sales records must cover the full amount of biodiesel. Buyers (identified consumers and retailers) must be identified. Measuring instruments must be calibrated annually by an accredited entity.*
2.3.2 NCV_{BD}	*Low*	*Laboratory undertaking the NCV analysis must be certified or accredited according to national standards. Both the sampling and analysis must be undertaken by the laboratory.*
4.1.1 M_{MeOH_y}	*Low*	*Cross check with calculated stochiometric alcohol requirements.*
4.1.2 $M_{Oil\_ester\_i\_y}$	*Low*	*Sum of oil from all crops i must equal* $M_{Oil\_ester\_y}$*. Establish input – output balance for the plant as a whole and for each crop. Cross check measured oil volumes with volumes calculated as seed mass x average oil content of seeds, and with measured biodiesel volumes.*
4.1.3 Y_{i_y}	*Medium*	*Ensure standardized measurement of seed mass and oil content of seeds for each crop. Ensure standardized measurement of cultivation area (ha) in the monitored sample of farmers.*
4.1.4 $m_{ON\_i\_y}$	*High*	*Ensure standardized measurement of organic manure mass. Measure N content of a sample of the manure in an accredited laboratory at least once, and cross-check with published values.*
4.1.5 $m_{SN\_i\_y}$	*Medium*	*Ensure standardized monitoring of amounts and type of synthetic fertilizer applied in the farmer sample. Use manufacturer specification on N content of each fertilizer.*
4.1.6 $m_{RNEX\_i\_y}$	*High*	*Ensure standardized measurement of the exported residue mass and types of each farmer.*

4.1.7 $m_{RN\_i\_y}$	*High*	*Ensure standardized measurement of the exported residue mass of each farmer. Measure N content of a sample of each residue in an accredited laboratory at least once, and cross-check with published values.*

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

>>

Attached as Annex 4: Monitoring Plan.

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

>>

Monitoring methodology developed by Factor Consulting + Management AG (Urs Brodmann) with contributions from Perspectives Climate Change (Axel Michaelowa)

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:

>>

The following greenhouse gas emissions are considered for the project activity. Other emission sources indicated in the baseline methodology are not applicable due to the following reasons.

- CO_2 from consumption of electricity in the biodiesel plant,
- CO_2 emissions from combustion of fossil carbon contained in the alcohol which is chemically bound in the biodiesel during the esterification process, and released upon combustion.

Project emissions from fossil fuel consumption of the biodiesel plant and upstream expellers are not applicable for the present project activity, since, the project proponents intend to use only 100% biodiesel onsite in boilers. Formulae provided in Section D.2.1.2 are used for estimating project emissions within the project boundary.

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

Year	2006	2007	2008	2009	2010	2011	2012
Emissions from electricity use, (tCO_2e)	694	892	892	892	892	892	892
Emissions from alcohols (tCO_2e)	85	120	120	120	120	120	120
Total Project emissions (tCO_2e)	779	1012	1012	1012	1012	1012	1012

E.2. Estimated leakage:

>>

The project activity results in leakage as emissions associated with the production of Alcohols used for esterification. Other leakage emissions as specified in the baseline methodology are not applicable for the present project activity due to the following reasons.

- Application of N-fertilizers in oil crop plantations is not envisaged. By products such as deoiled cake, bio fertilizers etc. will be utilised by project participants.
- New oil crop plantations are proposed only on severely degraded lands, waste lands, bunds etc. Hence, deforestation and land clearing are not applicable.
- Displacement of existing uses of oil crops and enhanced demand for fossil fuels is not applicable
- Export of biodiesel is not anticipated.

Formulae provided in Section D.2.3.2 are used for estimating leakage emissions outside the project boundary. Summery of the leakage as estimated for the crediting period is furnished below.

Year	2006	2007	2008	2009	2010	2011	2012
Methane emissions (tCO_2e)	32	41	41	41	41	41	41
Total leakage emissions (tCO_2e)	32	41	41	41	41	41	41

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

>>

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

Year	2006	2007	2008	2009	2010	2011	2012
Project Emissions (as per E.1)	779	1012	1012	1012	1012	1012	1012
Leakage (as per E.2)	32	41	41	41	41	41	41
Sum of above E.1. & E.2.	811	1053	1053	1053	1053	1053	1053

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

>>

Baseline emissions comprise the emissions from the displaced fossil fuels. Formulae provided in Section D.2.1.4 are used for estimating baseline emissions in the absence of the project activity. Summary of the baseline emissions are tabulated below.

Year	2006	2007	2008	2009	2010	2011	2012
Baseline emissions, tCO_2e	21,662	27,851	27,851	27,851	27,851	27,851	27,851

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

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

Year	2006	2007	2008	2009	2010	2011	2012
Baseline emissions, tCO_2, **E4**	21,662	27,851	27,851	27,851	27,851	27,851	27,851
Project emissions, tCO_2, **E3**	811	1053	1053	1053	1053	1053	1053
Emission reductions, tCO_2	20,851	26,798	26,798	26,798	26,798	26,798	26,798

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

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Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of emission reductions (tonnes of CO_2e)
2006	779	21662	32	20851
2007	1012	27851	41	26798
2008	1012	27851	41	26798
2009	1012	27851	41	26798
2010	1012	27851	41	26798
2011	1012	27851	41	26798
2012	1012	27851	41	26798
Total (tonnes of CO_2e)	6851	188768	278	181639

SECTION F. Environmental impacts

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

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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:

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No significant environmental impacts are considered.

SECTION G. Stakeholders' comments

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

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Attached as Annex 5: Stakeholders comments.

G.2. Summary of the comments received:

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No comments on the project have been received.

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

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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, 3rd Floor, Office Block, Samrat Complex, Saifabad
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E-Mail:	biofe@sol.net.in
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Salutation:	MR.
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First Name:	SATISH
Department:	
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Direct FAX:	
Direct tel:	
Personal E-Mail:	satish@sol.net.in

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_2 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 in charge 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

All parameters as listed in Section D will be monitored by the project participants which comprise project emissions due to electricity consumption, biodiesel production, electricity emission factor etc.

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

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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