The Gold Standard
Premium quality carbon credits

THE GOLD STANDARD:
Project Design Document for Gold Standard
Voluntary Offset projects

(GS-VER-PDD)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity

Title: Production of Bio-diesel from Used Cooking Oil, Bahamas
Version: 2
Date: 8 Nov 2007

A.2. Description of the project activity

The project will transform the large quantities of used cooking oil produced by cruise ships and hotels in the Bahamas into bio-diesel, and sell this bio-diesel for use in vehicle engines on the island of New Providence as a direct replacement for the petroleum diesel currently in use. The bio-diesel will be blended with petro-diesel to comprise 20% of the final volume.

The project will avoid the CO2 emissions which would be incurred by continuing use of substituted petro-diesel, net of emissions associated with the production of the bio-diesel. This reduction of GHG emissions is the main purpose of the project.

Several side-benefits will occur, primarily the avoidance of GHG emissions associated with:

- the production of the replaced petro-diesel
- the transport of replaced petro-diesel (this is imported into the Bahamas by ship)
- decomposition of the used cooking oil (the oil is largely disposed of in land-fill sites where it contributes to methane emissions, these being currently uncontrolled in the Bahamas)
- use of kerosene as a heating fuel for asphalt processing (a by-product of the bio-diesel production process is crude glycerine which will be used to substitute for kerosene)

A brief technical description of the trans-esterification process is provided in Annex 4.

In terms of sustainable development, the project is tested against a set of indicators as presented in Table A1: “Justifications for SD matrix scores” below. The following comments support the scores given on the table.

Table A.1: Justifications for SD matrix scores

Water Quality	The plant is designed to avoid pollution of water resources, potentially associated with glycerol dissolving into wash water or methanol vapour being absorbed, as follows: (a) Rather than using a water wash system to purify the raw biodiesel, the plant will use a dry-wash system in which an ion resin removes residual glycerol, and contaminants. Wash water will no longer be an output in the process. (b) The separation of the glycerol from the biodiesel will occur via a centrifuge, and does not use water in the process. (c) Methanol recovery will occur from the glycerol after it is separated from the biodiesel via vacuum distillation. Recovered methanol will be returned to bulk storage for re-use. A portion of the glycerol will be mixed with biodiesel and/or waste cooking oil and used as heat (~ 40,000 btu/gallon) for the processing facility and the remainder will be sold to a hot-mix asphalt company to be blended with kerosene for heat.

	(d) safety and waste-water protection issues are addressed comprehensively in the Environmental Management Plan as provided in Annex 6.2. For example this covers the handling of sodium hydroxide (NaOH).
Air quality	Bio-diesel produces less particulates and carcinogenic aromatic hydrocarbons than petro-diesel. At the same time, there is the risk of increased NOx emissions. US EPA studies have shown that NOx emissions both increase and decrease depending on engine family, loading characteristics, type of biodiesel feedstock used and other environmental conditions (annex 6.6). Actual tests showed that NOx tended to increase on engine tests, but that they decreased on vehicle tests. It was also noted that neither the engine tests, nor vehicle tests constituted a representative sample. In view of this inconclusive result for NOx, and the very clear benefits in regard to PM and HC, there is confidence in an overall improvement in air quality. Nevertheless in the interests of conservativeness a neutral score is given here.
Other pollutants	Because it has lower marine toxicity and is highly biodegradable, the bio-diesel has significant benefits to the marine environment due to routine emissions of unburned fuel through boat exhausts and also ground-based spills.
Soil condition	The high degradability of bio-diesel implies that spillage effects on soil condition will be less severe. Because the degree of this benefit is not easy to assess, a neutral score is given.
Biodiversity	The implication of lower toxicity and high biodegradiblity is an improvement in bio-diversity. Because the degree of this benefit is not easy to assess, a netral score is given.
Employment type and quality	(a) The processing plant provides new jobs for local people which have a strong measure of skill learning and professional career development, being associated with an industry that is expected to grow in size (for example, Plant Manager, Plant Operators/technicians). The managing director of the plant is attaining a 20% equity interest in the company earned through performance rather than cash contributions as his access to capital is limited. (b) Cape Systems is also investigating ways to expand capacity by applying new technologies such as algae biodiesel production, or substituting ethanol for the methanol by building a small ethanol facility using cellulosic technology. These efforts will continue to create job opportunities.
Lively-hood of the poor	Cape Systems is developing a community waste oil collection program that will pay $0.50/gallon to any person who collects and delivers usable waste cooking oil to our plant. This allows for a low-infrastructure grass-roots process to assist unemployed or

	underemployed persons.
Access to energy services	The technology does not impact significantly on access to energy services, although the implication of improved self-sufficiency in fuel is that access would be better in conditions of severe petro-diesel shortage.
Human and institutional capacity	The bio-fuel plant is operated by a local company staffed by local people, and is linked to an educational institution which professionalizes local students; it is also a general model for growth of local technological and managerial skills and increased socially responsible business capability in the Bahamas.
Employment (numbers)	(a) The processing plant directly provides new jobs for local people as follows: (1) Plant Manager (5) Plant operators/technicians (at full operation with 2 per shift and 3 shifts/day) (1) Security Guard (1) Janitorial Staff Book keeping, legal, engineering work will be contracted out. (b)In addition we intend to initiate a community recycling program for waste oil which can provide revenue for independent entrepreneurs for hauling used cooking oil to the plant. We are presently addressing issues of quality control management and security at the plant that may be associated with this component. (c) We see this plant as a catalyst in some ways – opening the door in a new market to bio-fuels. As such, we are looking forward to continuing to investigate ways to expand our capacity by applying new technologies such as algae biodiesel production, or substituting ethanol for the methanol by building a small ethanol facility using cellulosic technology. These efforts will continue to create job opportunities. In addition to these jobs, the managing director of the plant is attaining a 20% equity interest in the company earned through performance rather than cash contributions as his access to capital is limited.
Balance of Payments (sustainability)	The bio-fuel plant will replace some 10% of the islands on-road diesel fuel demand and so making significant savings in cost of imports.
Technological self-reliance	Local production of bio-fuel will build the country's technological self-reliance and reduce the economic damage caused by petro-diesel price fluctuations

Sustainable Development Matrix (indicators with aster ices are monitored)	Score (+ or – on micro-scale)
Local/Regional/global environment	
Water quality* and quantity	0
Air quality*	0
Other pollutants*	+
Soil condition	0
Biodiversity	0
Sub-total	+
Social sustainability and development	
Employment	0
Livelihood of the poor*	+
Access to energy services	0
Human and institutional capacity	+
Sub-total	+
Economic and technological development	
Employment (numbers)*	+
Balance of Payments (sustainability)	+
Technological self-reliance	+
Sub-total	+
TOTAL	+

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Cape Systems Ltd (CSL) (host)	Private Entity (*)	Yes
Pioneer Carbon Ltd (PCL)	Private Entity (*)	Yes

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

The project manufactures bio-diesel on the island of New Providence in the Bahamas. New Providence is home to 70% of the population of the Bahamas, and is the location of the capital Nassau.

A.4.1.1. Host Party(ies):

Cape Systems Ltd, Nassau, New Providence

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

New Providence, Bahamas

A.4.1.3. City/Town/Community etc:

Nassau

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

Bahamas Biofuel will operate the bio-fuel plant under supervision by Cape Systems Ltd. The location of the plant is on property owned by Bahamas Waste, Limited and leased to Biofuels Bahamas, Ltd.:

Contact Person(s): Jack Kenworthy, jbkenworthy@capesystemslimited.com, 242-557-7612

Address: Biofuels Bahamas , P.O. Box N-4827, Nassau, New Providence, Bahamas

Physical location of the plant: The plant and offices are physically located at the Bahamas Waste facility on Gladstone Road, Nassau, New Providence. This location is central to waste oil collection and biodiesel distribution on the island of New Providence.

A.4.2. Size of the project:

Micro-scale (less than 5,000 tonnes of CO2 saved per year)

This project is not part of a larger project.

A.4.3. Category(ies) of project activity:

A.1.1.3 Liquid Bio-fuels

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed 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:

The project will reduce the GHGs emitted by vehicles in the Bahamas by replacing petro-diesel with bio-diesel manufactured from used cooking oil combined with a percentage of methanol.

The project has not previously been announced for implementation without seeking carbon finance within the last 3 years.

The UNFCC Additionality Tool (Version 2) requires that 5 steps are taken to investigate whether or not the GHG reductions would be obtained in the absence of project activity. Taking these 5 steps in turn:

1. *Singular compliance: is this project the only one alternative that is in accordance with legislation and regulations with which there is general compliance?*

   The three alternatives prescribed by the Additionality Tool are: continuation of existing practice, operating a project without Emission Reduction support, or designing a project achieving the same result using different methods. Of these alternatives the first is the most feasible in practical terms, and it is in compliance. There is no legislation in the Bahamas that requires the use of bio-diesel.
   Cape Systems and our partners evaluated the possibility of other alternative uses for the used cooking oil in New Providence and determined that biodiesel was the most viable current alternative. We also concluded that the most likely scenario in the absence of a biodiesel facility to process the oil was that the existing practices would remain in use. The alternatives we considered were:

   - Using the unprocessed oil in the island's electricity generators: The Bahamas Electricity Corporation is the sole electricity provider on the island of New Providence, having been granted a monopoly under the Bahamas Electricity Act of 1956. As such they control the purchase of all fuel for their generators and have supply contracts with major oil companies for their fuel which prohibit them from using other fuels while the contract is in effect. Secondly, the waste cooking oil represents less than 1% of all fuel used for electrical production in New Providence. The 300 MW power plant consumes nearly 90,000,000 gallons of #2 diesel fuel and bunker oil each year. For BEC the cost and hassle of using the waste cooking oil is not worth it. Further, they have had bad experiences using old motor oil in very low blends (< 1%) in their generators, as it caused injector failures and there are fears that the same problems may arise.
   - Using the waste cooking oil directly in the cruise ships without processing: For many of the same reasons as above, cruise lines appeared more interested in dealing with the waste through incineration than trying to extract value from it. Coast Guard regulations regarding fuel storage and transport on board, the basic preprocessing that would be necessary for reliable combustion are not worth the challenges. What is apparent from our research is that the volume of oil is only significant enough to be worth pursuing at ports where dozens of ships each week come to port and routinely offload waste.
   - Using the waste oil directly without processing for tar heating: The hot mix asphalt company in New Providence is a licensed incinerator of waste oils. However, they only use toxic wastes where there are regulations in place that require the provider of the fuel (used motor oil, contaminated diesel, kerosene and gasoline) to pay for the proper disposal of the fuel. In this scenario the hot mix company either has the fuel delivered for free or is paid to collect it. Because the waste cooking oil is not required to be disposed of in this way, it represents a cost of $0.50 to $0.85/gallon for the company and is not economical. They are willing to take our glycerol for free and use it as a heat source however.
   - Capturing and flaring methane from the landfill where the used cooking oil is currently deposited. Waste cooking oil is an environmental contaminant and should not be allowed to be transported and dumped openly in a landfill where rats insects and birds can become vectors for bacteria and disease that may be

growing in the oil. Further, some of the used cooking oil makes its way into the water table where it is able to contaminate ground water. We believe that methane capture from landfills is a worthy project, but it is not a good enough reason to allow contaminants in to landfills in an uncontrolled manner. The first step should be to capture wastes at their highest value, in this case as relatively clean used cooking oil, and cycle them up in value, rather than to let them degrade and capture residual value from them. The public landfill in New Providence receives approximately 547,000 tons of municipal solid waste each year. The waste oil that is currently directed there represents a mere $1/10^{th}$ % of the tonnage going to the landfill each year and thus its removal should not compromise the feasibility of a methane capture and recovery operation there

2. Investment analysis. *What were the investment constraints?*

- The high likelihood of significant diesel price fluctuations in future years caused potential investors to be reluctant to provide finance
- The carbon finances reduces the risk of insufficient sales revenue due to a drop in global oil prices which would demand a corresponding drop in bio-diesel sale prices to maintain sales.
- The contribution of a significant portion of needed start-up funds through carbon finance made the crucial difference between a project launch and no project.

  - The Business Plan for this project is provided in Annex 6.3 as a supporting document. The structure of Bahamian law requires that foreign companies have local partners in a minimum 50/50 equity split and that the equity be representative of real consideration given by both parties. Cape Systems and Bahamas Waste are now engaged in a 49/51 equity split respectively. The total capital required by the startup is $600,000 and each partner is investing equally at $300,000 per partner. Cape Systems is in a unique position because we are 100% owned by a non-profit entity (Cape Eleuthera Island School) and as such we cannot seek equity finance sources for our investment capital in the joint venture. Instead we have to rely on loans and as a young startup company, loans are difficult to acquire. We have raised funds through our non-profit parent that are to be loaned to Cape Systems for investment in the biodiesel venture in an amount no greater than $200,000 and the carbon finance allows us to meet the investment requirement for the plant. We have paired down the required investment in the plant through several iterations from an initial capital requirement of $1,500,000 to the current figure of $600,000. We can safely start the business with less capital and maintain quality and safety standards that are so critical to the long term health of the company. We are required to split the investment with our partners 50/50 and they have communicated that they will not proceed in the venture without our technical expertise. Since our traditional finance options are limited to debt and our debt is limited to $200,000, the carbon finance provides the way to make the project go forward.

3. Barrier analysis. *What other barriers prevent project launch?*

An important obstacle to the use of bio-diesel in the Bahamas is a lack of knowledge amongst vehicle fleet operators as its validity as a replacement fuel, as well as lack of knowledge as to its production from used cooking oil. The introduction of carbon finance displays confidence in the measurable environmental benefits of biodiesel in a place where they are not well known, and displays confidence in its technical feasibility and validity as a replacement fuel, which makes it possible to sell the fuel and also to attract further investment from investors interested in environmental preservation.

Although it is the case that most vehicle manufacturers certify their engines for 5% blend BDF and not 20%, we are confident that this does not pose a technical obstacle (supporting evidence in Annex 6.5) and further, that the barrier implied of customer uncertainty is surmountable, for the following reasons:

- There has been widespread testing done on fleets with biodiesel concentrations of B20 (20% biodiesel, 80% petroleum diesel). This blend is the basis for the US biodiesel standard ASTM D-6751. Many of the concerns with high blends of biodiesel are minimized due to the warm nature of the climate. There is potential concern about the oxidative stability of the fuel in a warm climate, but storage times will be kept to a minimum (< 30 days) due to production/delivery scheduling and usage patterns.
- Part of the reality of a country such as The Bahamas is that many of the engines are older and out of warranty. In addition, much of the petroleum diesel that is sold does not meet the warranty specifications of most OEM's. The addition of biodiesel is considered by many major companies (Bahamas Mack Truck included) to be a beneficial additive.
- Out intended fleet of engines is widely varied and includes Mack Truck, Caterpillar Diesel, and Detroit primarily.

4. Common practice analysis. *Could the project be seen to be common practice?*

   There is no similar project taking place in the Bahamas, with or without carbon finance support. There is no indication that the project could be viable independently on the basis of evidence of other similar projects. There have been other entities that have evaluated the prospects of building a biodiesel plant in Nassau and have not been able to secure funding for the project.

   There are currently no commercial biodiesel facilities in The Bahamas, or other Caribbean islands, despite the need for low-cost diesel alternatives and a relatively large diesel market. Part of the reason is access to feedstocks of oils and fats to be converted into biodiesel. Much of the profitability of a biodiesel facility is linked to the cost of feedstock supply and in islands where oil feedstocks need to be imported, these costs can be high. This high cost is mitigated, however, by the comparatively high cost of diesel fuel.

5. Impact of carbon funding

   The carbon finance overcomes the investment barriers listed above.

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

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
1	652
2	1,324
3	2,443
4	3,332
5	3,705
6	3,705
7	3,705
Total emission reductions (tonnes of CO_2 e)	18,866
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	2,695

SECTION B. Application of a baseline methodology

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

The project is follows the CDM approved methodology AM0047 *Production of waste cooking oil based bio-diesel for use as fuel. Version 01.* By inference it draws on the sources quoted for the methodology, namely:

- approved methodology ACM006
- new methodologies NM0082-rev [recommended A case 20th meeting of the Meth. Panel],
- NM0108-rev
- NM0142 [recommended B case 20th meeting of the Meth. Panel].

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

The methodology is applicable by virtue of generating emission reductions in the manner analyzed by the methodology, albeit with reference to a project located in a different country. It is abbreviated in Annex 2 of this PDD for the sake of transparency and to illustrate its applicability.

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

To apply the methodology in the context of the project activity the following formulae are used to calculate the baseline

Baseline Emissions

$BE_{,y} = M_{bd,y} \cdot U \cdot NCV_{bd}/NCV_{pd} \cdot EF_{pd}$

where

BE,y	Baseline emissions in year y	t CO2
Mbd,y	Mass of bio-diesel to be produced in year y	tonnes
EFpd	Emission Factor (EF) of petro-diesel	tCO2 / t petro-diesel (IPCC default)
U	Utilization ratio	Mass of bio-diesel used in vehicle engines divided by mass produced
NCVbd	Calorific value of bio-diesel	GJ / t
NCVpd	Calorific value of petro-diesel	GJ / t

The parameter values are listed below, and the calculation result. The market demand for the bio-diesel fuel (BDF) product is well known, such that utilization is predicted to be 100%. The list of monitored parameters includes Utilization ratio U, such that the risk of incorrect estimation of emission reductions through under-use of the BDF produced is eliminated. Market research showed that the market is large enough to absorb all production (Annex 6.1) and also the pricing strategy adopted ensures that all the BDF will be sold (Annex 6.1).

In order to be conservative and consistent with parallel projects, the calorific ratio of petro-diesel fuel (PDF) and BDF is used to reduce the estimate of displaced PDF in accordance with the methodology. In practice it is likely that better performance will be achieved from the BDF, according to the EPA: *"A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions", US Environmental Protection Agency, EPA420-P-02-001, October 2002.*

Baseline Emissions

Mass of bio-diesel to be produced Mbd	tabulated below	tonnes
Density of #2 petro-diesel	0.85	kg/litre
EF petro-diesel EFpd	3.17	tCO2 / t petro-diesel (IPCC default)
Utilization ratio U	1	Mass of bio-diesel used in vehicle engines divided by mass produced
NCVbd	4,013	GJ / t
NCVpd	4,333	GJ / t

Year	Production BDF US galls	Displaced petro-D tonnes Mbd	Baseline emissions tCo2 BE
1	89,910	289	849
2	179,820	579	1,699
3	333,000	1,071	3,146
4	449,550	1,446	4,247
5	499,500	1,607	4,719
6	499,500	1,607	4,719
7	499,500	1,607	4,719

Application of the project and leakage emissions methodology is worth considering in this context as it bears on the baseline assessment. The following values are used for the calculation parameters:

Project Emissions

Electrical energy consumed Q	tabulated below	MWhrs
EFelectricity EFe	0.8	tCO2 / MWhr (IPCC default for diesel grid)
EE = Q . EFe		
Volume of methanol in BDF Qmeth	calculated	
Percentage of methanol by volume in bio-diesel	16%	of BDF volume
Specific energy SEmeth	16	MJ / litre
EF meth	84	tCO2 / TJ
Volumetric units	3.79	litres/US gallon
Methanol emission per gall BDF	0.000814	tCO2 / gallon BDF produced
EM = Qmeth.SEmeth.EFmeth		
Transport emissions Etr	0	Negligible due to proximity of supply and delivery points
Other Emissions Eo	0	None
PE = EE + EM + Etr + Eo		

Leakage Emissions

Mass of UCO displaced Mduco	0	Survey shows no evidence of absence of UCO leading to increased use of fossil fuels.
EF fuel displaced by UCO EFfduco	N/a	Applies only in cases where Mduco is more than 0

Leakage due to displaced UCO Lduco	0	Lduco = Mduco . EFfduco
Density of methanol	0.792	kg/litre
Mass of methanol per gallon BDF Mmeth	0.48	kg / gall BDF produced
EF production methanol EFprod.m	1.95	t CO2 / t meth
Lprod.meth per gall BDF = Mmeth . EFprod.meth	0.000935	t CO2 /gall BDF produced
LE = Lduco + Lprod.meth		
Net emission reductions		
Fraction other feedstocks Xof	0	No other feedstocks for substitution or combination
Fraction exported Xex	0	No export
Emissions associated with other feedstocks ERof	N/a	Applies only in cases where Xof is more than 0
ER = (BE - PE - LE) . (1 - Xof - Xex) + ERof		

With respect to the requirement for a conservative approach and a leakage analysis the methodology is applied as indicated by baseline survey results:

- no displaced UCO leakage risk exists in the sense that no danger of increased fossil fuel use was identified once the feed-stock supply is secured. The waste oil resource database, established through a detailed survey of all waste oil providers indicates the current disposal patterns for each specific source. In all of the cases where the oil is collected from cruise ships, the oil is presently being incinerated as a component of the carbon waste (also including food scraps, paper) and this process actually consumes diesel fuel to completely incinerate the wastes. Ship’s engineers have confirmed that the heat from the incineration process is not used to provide any service on board as there is currently an excess of waste heat from the normal operation of the ship’s engines and generators. For this reason, the use of waste oil from cruise ships for bio-diesel has the effect in this project of reducing diesel use for incineration purposes
- For the land based (restaurants, hotels) waste cooking oil sources, over 99% of the current waste stream is being hauled as a component of the garbage and deposited at the dump, where it is decomposing – and breaking down to form methane and other landfill gases. There is no established reuse of the cooking oil currently in place in New Providence and no reclamation is possible once the oil reaches the dump site as this area is government owned and secured by razor wire fencing and security guards.
- Only one UCO supplier reported that less that 150 gallons/week of UCO was being taken home by employees who were using this for as a frying oil and a feedstock for pigs. There as no indication that the removal of this oil would stimulate use of fossil fuel. Further, it was found that considerable waste cooking oil remains available in circulation throughout New Providence to compensate for this resource being removed. In response to stakeholder comment Cape Systems is purchasing unhealthy used oils from individuals such that healthier cooking oils will be more readily affordable.
- emission reductions due to decomposition of UCO in landfill disposal sites will be avoided
- emission reductions are likely to arise resulting from displacement of fossil fuels by the crude glycerine by-product, since it can be sold for asphalting – these reductions may be as much as 40 tCO2e/year given the current annual consumption of kerosene for this purpose (20 tonnes/year)

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 VER project activity:

The BDF sold to transport companies in the Bahamas will replace the GHG emissions associated with the petro-diesel which would otherwise have been used.

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

The project boundary is defined as the geographical area of the Bahamas. The bio-diesel produced is intended for sale and use within island of New Providence for land and marine applications, but the possibility of use in other islands of the Bahamas is also open. Bio-diesel sold or used outside the Bahamas is excluded from emission reduction calculations, in order to eliminate the risk that the emission reductions could be double-counted.

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:

The business plan developed by Cape Systems Ltd is the baseline study for the project. This study indicates that some 15,000 gallons of petro-diesel are consumed each day for land based transportation on New Providence Island.

Bio-fuels Bahamas will produce between 1,000 and 1,500 gallons of ASTM and EN certified bio-diesel fuel each day within the first three years, and the fuel will be sold to bulk clients on a contract basis. Tour operators, SCUBA outfits, and tourism related service providers are primary targets for sales. CSL have secured verbal confirmation from many interested parties, indicating sales of over 300,000 gallons per year within three years, with every expectation of rising sales there-after.

The key baseline information is the substitution of this quantity of petro-diesel.

The baseline study and CSL Bio-Fuel Business Plan was completed in July 2006. CSL are a project participant. The contact information for CSL is provided 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: 1st April 2008

C.1.2. Expected operational lifetime of the project activity: 7 years 0 months

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

The crediting period is renewable.

C.2.1. Renewable crediting period: 7 years

C.2.1.1. Starting date of the first crediting period: 01/04/08

C.2.1.2. Length of the first crediting period:7y-0m

C.2.2. Fixed crediting period: NA

C.2.2.1. Starting date: NA

C.2.2.2. Length: NA

SECTION D. Application of a monitoring methodology and plan

Please note that data monitored and required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of VERs for this project activity, whatever occurs later.

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

The monitoring methodology proposal is submitted in Annex 2

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

The methodology is specifically designed to match the project conditions.

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

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
1. Mbd	*Bio-diesel produced*	*Production records and CSL & BB accounts*	*US gallons*	*M*	*Quarterly*	*100%*	*Electronic and paper*	
2. U	*Utilization ratio*	*Contracts and customer payment records, blending records, quality certification reports*	*US gallons*	*M*	*Quarterly*	*100%*	*Electronic and paper*	
3.NCVbd	*Calorific value of BDF produced*	*Quality certification reports*	*MJ/kg*	*M*	*Annually*	*Sample*	*Electronic and paper*	
4. Q	*Electrical energy used in production of above quantity*	*Supplier invoice records and production records, CSL & BB accounts*	*MWhrs*	*M*	*Quarterly*	*100%*	*Electronic and paper*	
5. Qmeth	*Methanol used in production of above quantity*	*Supplier invoice records and production records, CSL & BB accounts*	*litres*	*M*	*Quarterly*	*100%*	*Electronic and paper*	
6. Etr	*Emissions due to transport*	*Reviewed if main sales not vicinity*	*tCO2e*	*e*	*Quarterly*	*100%*	*Electronic and paper*	
7. Eo	*Emissions due to other fuels used during production*	*Records of production process*	*tCO2e*	*c*	*Quarterly*	*100%*	*Electronic and paper*	
8.Xof	*Fraction of non-UCO feedstock*	*Records of production process*	*fraction*	*M*	*Quarterly*	*100%*	*Electronic and paper*	

9. Xex	*Fraction of BDF exported*	*Sales and production records*	*fraction*	*M*	*Quarterly*	*100%*	*Electronic and paper*	
10. ERof	*Emission reductions due to other feedstocks*	*Production records and customer invoices*	*tCO2e*	*c*	*Quarterly*	*100%*	*Electronic and paper*	
11. Water quality	*a. Quantity of methanol vapour absorbed into waste water b.ditto glycerol.*	*Inspection report by CS expert staff concerning methanol and glycerol storage, handling, and extraction practice in respect of water absorption risk*	*% mass*	*e*	*Quarterly*	*100%*	*Electronic and paper*	
12.. Air quality	*PM, HC, NOx*	*Recent international analysis; review of literature*	*Ppm and as appropri ate*	*e*	*Annually*	*International review*	*Electronic and paper*	
13. Other pollutants	*PDF Spillage rates and Marine, water-courses, and soil pollutants*	*Recent international analysis; review of literature*	*Ppm and as appropri ate*	*e*	*Annually*	*International review*	*Electronic and paper*	
14. Lively-hood of the poor	*Opportunities for underemployed or unemployed persons*	*BB records*	*Income & opportu nity*	*e*	*Annually*	*100%*	*Electronic and paper*	
15. Employment (number)	*Number of jobs at the plant*	*BB records*	*Number of jobs*	*M*	*Annually*	*100%*	*Electronic and paper*	

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

Both baseline and project emissions parameters are measured in order that emission reductions are monitored:

Baseline Emissions

BE,y = Mbd,y . U . NCVbd/NCVpd . EFpd

where

BE,y	Baseline emissions in year y	t CO2
Mbd,y	Mass of bio-diesel to be produced in year y	tonnes
EFpd	Emission Factor (EF) of petro-diesel	tCO2 / t petro-diesel (IPCC default)
U	Utilization ratio	Mass of bio-diesel used in vehicle engines divided by mass produced
NCVbd	Calorific value of bio-diesel	GJ / t
NCVpd	Calorific value of petro-diesel	GJ / t

Project Emissions

PE,y = EE,y + EM,y + Etr,y + Eo,y   t CO2

where

PE,y	Project emissions in year y	t CO2
Q	Electrical energy consumed in year y	MWhrs
EFe	EF for electricity at facility	tCO2 / MWhr (IPCC default for diesel grid)
EE = Q . EFe		t CO2
Qmeth	Volume percentage of methanol in BDF	
SEmeth	Specific energy of methanol	MJ / litre
EF meth	EF for methanol	tCO2 / TJ

EM = Qmeth.SEmeth.EFmeth	Methanol emission per gall BDF	tCO2 / gallon BDF produced
Etr,y	Transport emissions in year y	Negligible due to proximity of supply and delivery points
Eo,y	Other Emissions in year y	None

Emission reductions

ER = (BE - PE - LE) . (1 - Xof - Xex) + ERof		t CO2
where		
Xof	Fraction of other feed-stocks and fossil components of UCO	
Xex	Fraction exported	
ERof	Emissions associated with other feedstocks	t CO2

D.2.3. Treatment of leakage in the monitoring plan

Monitored data shall be archived for 2 years following the end of the crediting period.

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

In the case of leakage via methanol production, the leakage formula is applied, and the mass of methanol is known via the monitoring regime for project emissions.

The baseline survey established that no UCO was being used in the baseline as a fuel and therefore no risk existed of increased use of fossil fuel – especially as the baseline study also established that considerable quantity of UCO, very likely more than 25% of the mass used for BDF production remain in circulation regardless of the supply contract secured by Cape Systems and Bahamas Bio-fuel. Accordingly the quantity Mduco is not required to be monitored.

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
12. Mmeth	*Mass of methanol*	*Supplier invoice records and production records, CSL & BB accounts*	*litres*	*m*	*quarterly*	*100%*	*Electronic and paper*	

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

Leakage Emissions

LE,y = Lduco + Lprod.meth		t CO2
where		
Mduco, y	Mass of UCO displaced in year y	tonnes
EFfduco	EF fuel displaced by UCO	tco2e/t
Lduco, y	Leakage due to displaced UCO in year y	

Lduco = Mduco . EFfduco		
Mmeth	Mass of methanol per gallon BDF	kg / gall BDF produced
EFprod.m	EF production methanol	t CO2 / t meth
Lprod.meth per gall BDF = Mmeth . EFprod.meth		Leakage due to Production of methanol per gallon BDF

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

ER = (BE - PE - LE) . (1 - Xof - Xex) + ERof		t CO2
where		
Xof	Fraction of other feed-stocks and fossil components of UCO	
Xex	Fraction exported	
ERof	Emissions associated with other feedstocks	t CO2

Emission reductions (ER) arising from the project are made up of two components:

a. emissions occurring in the baseline scenario net of emissions arising from the project activity (PE) and net of leakage (LE). Further, any fraction of this net ER resulting from biodiesel exported outside the Bahamas, and any fraction of the feedstock containing fossil fuel or not CO2 neutral (including the possibility of non-UCO feedstocks being mixed in or replacing the UCO), is excluded.
b. the emission reductions associated with the "other feedstock" fraction

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.
1. Mbd	*Low*	*Cross-check production records, feedstock supply invoices, sales records and customer contracts with technical advice from CSL*
2. U	*Low*	*ditto*
3. Q	*Low*	*ditto*
4. Qmeth	*Low*	*ditto*
5. Etr	*Low*	*ditto*
6. Eo	*Low*	*ditto*
7.Xof	*Low*	*ditto*
8. Xex	*Low*	*ditto*
9. ERof	*Low*	*ditto*
10. Mmeth	*Low*	*ditto*
11. Water quality	*Low*	*Cape Systems supervises BB and has necessary technical expertise to make relevant inspections, literature searches and quarterly/annual summaries of findings as required by the monitoring schedule; verification provides the necessary QC/QA oversight*
12.. Air quality	*Low*	*Cape Systems supervises BB while verification supplies QC/QA oversight*
13. Other pollutants	*Low*	*Cape Systems supervises BB while verification supplies QC/QA oversight*
14. Lively-hood of the poor	*Low*	*Cape Systems supervises BB while verification supplies QC/QA oversight*
15. Employment (number)	*Low*	*Cape Systems supervises BB while verification supplies QC/QA oversight*

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

The proposed facility is a partnership between CSL, Bahamas Waste Ltd (BWL), and Bio-fuels Bahamas, Ltd (BBL). CSL will act as a 45% shareholder and controlling partner, while BWL will also hold a 45% equity, the remainder being held by David Lee who will act as plant manager and operator in charge of the staff of BBL. The operation is fully skilled and professionalized, David Lee having relevant professional experience in the chemical industry and CSL having successfully operated a pilot plant in recent years. The overall responsibility for collection of monitoring data and quality assurance as set out above rests with CSL, while its implementation, in regard to routine technical indicators, will be the responsibility of the plant manager, who will submit regular reports to project participants together with paperwork suitable for the cross-checks required by the quality assurance process. Tracking of any indicators listed not within scope of BBL will be done by CSL directly.

The CSL pilot production facility operates on the basis of Used Cooking Oil (UCO). CSL currently produces about 25,000 gallons a year of ASTM D-6751 quality fuel, and so has in recent years built sufficient experience to date of supply chain management and integration of the product into existing vehicle fuel supply contracts.

Cape Systems, Ltd. (CSL) is a wholly owned subsidiary of Cape Eleuthera Island School, a Bahamian non-profit company. CSL was created to expand the influence of the Island School sustainability model, by adding professional capacity, strategic partnerships and working more closely with the business and development communities. As a wholly owned subsidiary of a not-for-profit corporation, CSL is structured to support charitable projects through the Island School that align with its ongoing education, research and outreach missions. In this way CSL aims to create a model of applied business practices, rooted in sustainability, and tied to the education of future leaders. It is building these models on the foundations of honest evaluation, quality service, and cutting edge technology embedded in 8 years of regional experience. Cape Systems operates as a for-profit company, intended to generate sufficient revenue to employ cutting edge business people, engineers and designers while also providing financial support for the parent company in order to complement and extend the mission critical projects and at the same time reduce the fundraising burden on the non-profit side.

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

Pioneer Carbon Ltd (Project participant - contact information is provided in Annex 1)

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

The formula is:

$PE_{,y} = EE_{,y} + EM_{,y} + Etr_{,y} + Eo_{,y}$

Where each parameter is defined as in section D.2.2.2 above
For estimated project emissions, see the table of annual values in section E. 6 below

E.2. Estimated leakage:

The formula is:

LE,y = Lduco + Lprod.meth

Where each parameter is defined as in section D.2.2.2 above
For estimated leakage, see in section E. 6 below

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

See the table of annual values in section E. 6 below

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

The formula is:

BE,y = Mbd,y . U . NCVbd/NCVpd . EFpd

Where each parameter is defined as in section D.2.2.2 above
For estimated emission reductions net of this baseline, see the table of annual values in section E. 6 below

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

For estimated reductions, see the table of annual values in section E. 6 below

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

Year	Project emissions				Leakage	Emission
	Electricity	Electricity	Methanol	Total		Reductions
	MWhrs	tCO2	tCO2	tCO2	tCO2	tCO2
	Q	**EE**	**EM**	**PE**	**LE**	**ER**
1	50	40	73	113	84	652
2	75	60	146	206	168	1,324
3	150	120	271	391	311	2,443
4	160	128	366	494	421	3,332
5	175	140	407	547	467	3,705
6	175	140	407	547	467	3,705
7	175	140	407	547	467	3,705
				Total ER		18,866

SECTION F. Environmental impacts

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

No adverse environmental impacts will take place as a result of the project activity. No EIA is required for this project by local government. The project complies with local environmental leglislation as detailed in the Cape Systems Environmental Management Plan and Emergency Response Plan. This is attached as Annex 6.2 EMP Bahamas Biodiesel.

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:

No EIA is required by local legislation.

SECTION G. Stakeholders' comments

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

A detailed description of the project (Annex 5) was published on the Cape Systems website (capesystemslimited.com) in March 2007 and has remained in place since that date, inviting comments from the public and stakeholders. In late March 2007 an advertisement was placed in the national newspaper inviting interested parties to a stakeholder consultation meeting. This meeting took place on 4 April 2007 and its minutes were recorded. In separate written and verbal consultations, based on publication of the project description on the Cape Systems web-site, comments were received also from a local environmental NGO.

G.2. Summary of the comments received:

G.2 (a) Minutes of Stakeholder Meeting 4 April 2007

Cape Systems, Biofuels Bahamas Community Meeting
April 4, 2007 6:45-8:15 PM
At the Bahamas National Trust Retreat, Village Road, Nassau, New Providence

I – Background: As part of our effort to engage stakeholders and community members in the development of a sustainable fuels industry in The Bahamas, Cape Systems, Limited advertised and hosted a community meeting which was open to the public. The meeting was advertised for more than 1 week in the Nassau Guardian and the Bahamas Tribune newspapers, the most widely read newspapers in The Bahamas. The Project Plan has been on Cape Systems' website for 6 weeks prior to the meeting of stakeholders (www.capesystemslimited.com/project-biofuels.html) .

II - Topic: *Biofuels and other Energy Solutions*

III - Presenter: Christian Henry- Cape Systems CFO and presenter

IV - Attendees:

Janelle Hutchinson - Sandals Royal Bahamian Hotel employee; also contracted with the STEMM (Sustainable Tourism and Entrepreneurship Management and Marketing) project interested in recycling and biofuels.

Trevor Hutchinson - Police Officer

Norman Gaye - Physician and former Bahamas Minister of Health 1984-1990.

Tonya Gaye- worked at Coral World for 9 years, now a dog trainer. Self described "environment girl", concerned about energy costs; father is Andrew Stirrup in Rock Sound.

Monique Innis - C.R. Walker Public High School Guidance Counselor and
former Science Teacher

Shawn Moore - The Tribune Newspaper, Marketing Director, putting together a section on environmental issues.

Tara Bredden - The Tribune Newspaper business section reporter

Sharron Fergusson - Mother and concerned citizen

Aaron Fergusson- C.R. Walker Public High School grade 10 student, with a renewable energy project to complete.

Selina Campbell - horticulturalist interested in how we can mitigate our carbon impact on the environment.

V – Presentation given by Cape Systems – 25 minutes with discussion on Nassau Biodiesel specifics as well as other efficiency and renewable energy technologies.

VI - Questions asked:

(Ericka Ferguson)- What is the meaning of renewable energy?
Renewable energy, for our purposes tonight, means any source of energy that comes from wind, solar, or biofuels. These are the most practical ways in which The Bahamas can be more energy independent and emit less carbon and other pollutants.

(Ericka Ferguson)- What are the types of renewable energy sources found in the Bahamas, and how frequently are they used?
At the Island School and Cape Eleuthera Institute, there is a total of about 44 kW of rated capacity of grid-intertied solar Photovoltaics, and 10 kW of wind power in the first such pilot project in the Bahamas. At Cape Eleuthera, there is a small scale bio-diesel plant making on the order of 10,000 gallons per year. Tiamo resort on Andros is using a stand-alone battery and generator backed up solar electricity system. These represent less than 1 percent of the electricity produced in the Bahamas. In terms of sources of renewable non-petroleum based energy, there are virtually no other projects.
There is one biofuels project in operation at Cape Eleuthera, taking waste vegetable oil from cruise ship fryers, and making it into bio-diesel, a substitute for diesel fuel. I am not aware of any other similar projects in the Bahamas.

(Ericka Ferguson)- What forms of renewable energy sources should be used in the Bahamas?

We believe that the highest immediate potential for renewable energy in the Bahamas is the manufacture and displacement of petroleum based diesel fuel by making bio-diesel from vegetable oil. Cape Systems is bringing partners together to build a manufacturing plant to do that here in Nassau.

There is lots of potential for grid-intertied electricity generation from wind and solar power, if only the government would institute a policy to support such grid-interties.

(Tonya Gaye): I thought it was illegal to be grid connected?
It is illegal at this point, but the Bahamian government is working with the InterAmerican Development Bank to develop a comprehensive energy policy, including a recommendation to the government to amend the 1954 Electricity Act to allow up to 2% of the total grid connected capacity to come from private renewable energy sources.

(Norman Gaye) What about the recent Supreme Court decision in the US regarding carbon emissions?
The Environmental Protection Agency in the US was petitioned in the 1990s by environmental groups to research the effects of carbon emissions and decide whether it was reasonable to treat carbon emissions as pollution or not. The EPA deferred the decision, saying that the issue was not within the scope of their mandate. The recent Supreme Court decision places full responsibility on the EPA to respond to the issue one way or the other, supporting its ruling on its treatment of carbon emissions with evidence. It's of increasing concern because it's believed that carbon emissions are largely responsible for the observed increase in worldwide average temperature, and projections of future impacts from carbon are potentially severe enough to begin regulating and creating incentives to reduce carbon emissions.

(Norman Gaye) Something I'm thinking about now: How do we dispose of our waste vegetable oil now?
We estimate that there are between 200,000 and 250,000 gallons of waste vegetable oil coming out of local businesses. The cruise ships dispose of the waste oil they generate out of the country or on board the ships.
(Norman Gaye) Going where?
It is ending up in the dump - it's likely to be soaking down into the aquifer, spoiling the fresh water lens. One of the best solutions is to find a human use for it. If we can make a biodiesel product from it, people will be less likely to let it go to waste.

(Selina Campbell) One of the issues I am very much concerned with is the number of vehicles on the road on this island (New Providence). And the sizes of the vehicles, and the fuel efficiency. Reliable public transportation must be put into place. We should limit the number of cars putting heavy taxes on imported cars to encourage hybrids. Basically everyone complains about the cost of gas, but people often have two cars.
Those are big problems. We feel like government has a role in influencing people's choices – right now there are import duty concessions for some renewable energy components and not others. But it's not usually government that pioneers changes in society- they are usually playing catch-up. We are hoping that a combination of innovative technologies, market dynamics, government policies, and awareness will help drive people to make different choices that make economic and environmental sense for the Bahamas.

(Selina Campbell) Is there a limitation on the size of projects that are eligible for carbon credit funding?
One of the stipulations for projects seeking carbon credit funding is that the project would not be able to move forward without carbon funding. Also, the project needs to be of a size that makes the costs of

reporting and compliance worth the effort. Projects that would attract $300,000 or more in overall investment would begin to meet that standard.

VII – Summary: The meeting was attended by a diverse set of individuals and organizations, ranging from government to business owners to researchers, teachers, students and non-profits. The general sentiment seemed to be that the project was of great interest. While there were no questions asked about the economics of the project, the presentation highlighted the process of making biodiesel, the CO2 emissions benefits and the foreign exchange benefits of making local fuel from a waste resource.

Cape Systems and its partners did not feel that we received any concerned feedback that would require us to modify elements of our business plan, but the meeting did highlight the value of meaningful, open dialogue with the public on our developments. The public, we feel, is our greatest ally in helping to advance and promote the renewable fuel expansion. We are presently making plans to host regular events at our processing HQ to help educate interested people on our project and on other worthy projects in the region.

We are continuing to seek public comments through our website.

In respect of of the interests of stakeholders belonging to disadvantaged sectors, in particular the unemployed, we are intending to develop the potential of the project to provide employment. In ths respect, we will be making the local unemployment agency aware of our plan to develop opportunities for local entrepreneurial hauling of waste oil to our site, as described in section A above with respect to the Sustainable development matrix.

Signed,

Jack Kenworthy
Vice President, Secretary
Cape Systems, Limited

G.2 (b) Record of Consultation with local environmental NGO

May 9, 2007

Memorandum: re: Conversation with BREEF

This memorandum shall serve as a record of the consultation that took place between Cape Systems, Limited (CSL) and members of the Bahamas Reef Environment Educational Foundation concerning the development of a waste oil to biodiesel production facility in New Providence. BREEF members were able to read the project description which has been available on Cape Systems' website prior to the meeting. Casuarina McKinney responded in writing, and Charlene Carey discussed with us by telephone, noted here.

CSL: Thank you for taking the time to read over the plans and meet with me. Do you have any questions about the structure or set-up of the plans for the biodiesel manufacturing plant in Nassau?

BREEF: There are some areas of vagueness in the proposal. It says that it is produced by a chemical process? What is that chemical process? It sounds like you are hiding it. I went online and read up about transesterification, the production of glycerol, and cleaving of fatty acids. You should try and explain the process in layman's terms, so a member of the general public would understand it.

CSL: That's great advice. The reaction process involves mixing lye (sodium hydroxide) with methanol (racing fuel), and then that mixture is reacted with the heated vegetable oil to make biodiesel and glycerin. We can take steps to fix that part of the proposal.

BREEF: Also, the plan says that using biodiesel reduces CO2 emissions. But it needs more information- compared to what? Online I found that a 20% blend of biodiesel produces 15% less CO2 emissions. Talk in the plan about specifically what less? Less particulates… Specifically what less?

CSL: Yes, good point. Sulfur dioxide emissions are reduced to zero compared to petroleum diesel fuels, and we can say that, and we should cite research information that gives people a more specific idea on what emissions are being reduced.

BREEF: Exactly. And also say why those reductions are important- for greenhouse gases, why that's important, and for CO2, why biodiesel is ok compared to petroleum based fuels. The report says that using biodiesel provides benefits by using a renewable vegetable based fuel- what is the vegetable based fuel and why is it an advantage? The lay person will not have a grasp on why a vegetable based fuel is advantageous. And about the dumping of the vegetable oil in the dump, the plan mentions methane gas. Explain why methane gas is bad, and mention the other effects- the plan should mention the effect on the ground water of dumping vegetable oil in the dump. Selling points: disposed in the dump. Whoever is the intended reader, would they know the negative parts of that? It says about methane, but would the average reader know about that? …water table.

CSL: Great. We can make those changes. What other questions do you have?

BREEF: There are a few typos: (highlighted on attached adobe document).

BREEF: Is there any plan for gas stations to offer it?

CSL: Right now, we anticipate that the first customers will be vehicle and boat fleet owners who do their own maintenance on their engines. That will help users gain confidence and manage any potential problems with clogged fuel filters. Biodiesel acts as a detergent and the fuel tanks are dirty, so that will help. Eventually it could be more widely available; there's no reason why retail diesel sellers couldn't blend it as a small percentage in their fuel and market that on its environmental advantages.

BREEF: What will the response of regular diesel suppliers be? They are your potential biggest competitor, and if they feel threatened, they will say you are selling diesel but taking away opportunities from the Bahamians involved in the diesel industry.

CSL: That's a good point. This biodiesel plant would be able to only supply a small fraction of the total transportation diesel needs in the Bahamas. What do you recommend?

BREEF: What about meeting with them? You could leave open the option to include them and explain to them what you are doing.

CSL: That's a good point. If they know us, and hear about the fact that we plan to price the biodiesel on par with diesel…

BREEF: …so you wouldn't be undercutting them, or competing with them…

CSL: Right. We have a relatively very small volume to them, and talk about the pricing issues. If they know about us directly, they are less likely to overreact based on incorrect information. They need to know we're relatively small, and not competing on price.

BREEF: You might talk to those people who sell diesel vehicles, so they also know and can advertise that their vehicles are in compliance.

CSL: Any other comments? This has been really helpful.

BREEF: I recommend the project. This is what we need to start thinking about and move towards, alternative sources of energy. Having Bahamas Waste on board is a positive thing… to have waste haulers in the know is a good thing.

Addendum:

Several key comments to be noted from Casuarina McKinney's letter.

1 – Corroborated the need to establish a community collection program, which we intend to do.
2 – Corroborated the desire to get some fuels in government vehicles.
3 – Suggested getting materials out to diesel engine resalers and begin education on the use of the fuel in their vehicles. We anticipate beginning this effort during year two of operations.
4 – Suggested putting signs or stickers on vehicles using biodiesel. We will use stickers on all company vehicles using biodiesel and will offer stickers to other customers who wish to use them
5 – Corroborated the need for public education in the plan which helped galvanize our plan to hold educational events at the processing site several times a year to discuss energy and resource use issues.

Signed,

Jack Kenworthy
Vice President, Secretary
Cape Systems, Limited

G.2 (c) Record of additional stakeholder consultation
May 9, 2007

Memorandum: re: Additional Stakeholder Input

Cape Systems has had many conversations with stakeholders over the past several months and years, in addition to the formal invitation and subsequent meeting that was held for public comment in early April 2007. This memorandum shall serve as a record of some of that input and how it has affected our project plan.

Mr. Marco Watson is the plant manager for the small scale biodiesel production facility located at the Island School on south Eleuthera. Marco has been in charge of all elements of operating the plant, from oil collection and storage to fuel production and quality control, for the past three years. Marco is a native resident of Wemyss Bight, Eleuthera, Bahamas.

In a conversation with Marco about the potential development of a Nassau based biodiesel plant that uses waste cooking oil much like the Island School plant, Marco made several important comments:

i. A lot of people in Nassau need work, and if you could pay people in Nassau to bring you some of the oil that comes out of the communities, you sure could have a lot more oil to process into biodiesel. Folks over there just put the oil back in the jugs and it gets hauled to the dump with the rest of the trash, same as here, and they don't even think to use it. If they could get a dime for bringing it to you, you would find a lot of takers and it would be good for the community.
ii. I would try to make the glycerin into some soaps that could be sold to tourists – I hear that the glycerin is a good ingredient in soaps. I have seen bars of soap that sell for $6 or $7 and I bet you could make a lot of bars from that glycerin.
iii. There has to be a way to get some of the Jitneys (public buses) that run through the downtown to run on the biodiesel. That would make the air smell a lot cleaner for everyone who has to work down there and for tourists who come to visit.

In response to Marco's input, we considered each element and made the following additions to our plan:

i. We loved this idea and plan to implement it as soon as the plant is operational. Not only does allowing individuals to cooperatively collect and dispose of their oil in a responsible way, but we will offer up to $0.50/gallon for high quality used cooking oil that is brought to our plant and it will likely cost us less than having to pick it up ourselves.
ii. We have evaluated making the glycerin into soaps, but the equipment to purify the glycerin to a high grade is prohibitively expensive. We will stick with our plan to use the glycerin as an energy source, both within the biodiesel plant for process heat and as a substitute for the kerosene at a local asphalt company.
iii. The biggest hurdle to this is that we have a relatively small volume of waste oil to supply the jitneys and each jitney is privately owned so it is very difficult to coordinate refueling. Once we get the plant established and develop a reputation for the fuel, we will look into then potential to diversify the client base for sales and potentially expand the plant with some locally grown feedstocks such as jatropha, or potentially algae.

Kevan Dean is Energy Manager at Kerzner International, owner of the Atlantis resorts. Kerzner is one of the waste oil suppliers for the biodiesel project and Kevan is responsible for the management of all energy sectors and some other areas of resource management. Cape Systems has had dozens of conversations with Kevan over the years regarding innovative energy use policies.

i. Kevan suggested that waste cooking oil programs should be part of a comprehensive waste management policy. Atlantis is creating a green waste program for lawn clippings and landscape wastes, and has also begun a "Cans for Kids" program which recycles aluminum cans and gives the proceeds to local charities. He sees waste oil management as an essential part of corporate responsibility in New Providence.

Cape Systems acts as a consultant to many large resorts and along with Biodiesel Bahamas is making efforts to urge management towards these initiatives, including, but not limited to, waste oil management systems.

Bob Simek is a consultant for several large hotels, including the Baha Mar development in cable Beach in Nassau.

i. He has advised that Cape Systems and BWL design and market a comprehensive waste oil management program that makes it easy for hoteliers to properly dispose of their waste oil at least cost.

Cape Systems has begun to work with waste oil system OEM's to perform such services.

Honorable Dr. Marcus Bethel is Minister of Energy and Environment for The Bahamas. Dr. Bethel has visited our biodiesel production facility and other renewable energy projects several times and has asked Cape Systems on several occasions to assist in preparing materials for government presentation on renewable energy projects happening within the country. He was present at a Grand Opening for our new research center last March (2006) and commented: "My Ministry is completely supportive of renewable energy and biofuels and we encourage Cape Systems' efforts in this regard."

Signed,

Jack Kenworthy
Vice President and Secretary
Cape Systems, Limited

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

(a) Stakeholder Meeting

This meeting confirmed the support from stakeholders for the project and its detailed design and did not give rise to any recommendations for changes or improvements.

(b) Consultation with local NGO

Cape Systems agreed with BREEF's recommendations and has improved the project description in line with the recommendations.

(c) Additional stakeholder inputs

Excerpt form the Cape Systems report on the consultation:

"In response to Mr Watson's input, we considered each element and made the following additions to our plan:

i. We loved this idea and plan to implement it as soon as the plant is operational. Not only does allowing individuals to cooperatively collect and dispose of their oil in a responsible way, but we will offer up to $0.50/gallon for high quality used cooking oil that is brought to our plant and it will likely cost us less than having to pick it up ourselves.

ii. We have evaluated making the glycerin into soaps, but the equipment to purify the glycerin to a high grade is prohibitively expensive. We will stick with our plan to use the glycerin as an energy source, both within the biodiesel plant for process heat and as a substitute for the kerosene at a local asphalt company.

iii. The biggest hurdle to this is that we have a relatively small volume of waste oil to supply the jitneys and each jitney is privately owned so it is very difficult to coordinate refueling. Once we get the plant established and develop a reputation for the fuel, we will look into then potential to diversify the client base for sales and potentially expand the plant with some locally grown feedstocks such as jatropha, or potentially algae. "

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Cape Systems Ltd
Street/P.O.Box:	P.O. Box 29, Rock Sound, Eleuthera
City:	Nassau
State/Region:	New Providence
Country:	The Bahamas
Telephone:	Bahamas Office Tel: 242-557-7612
E-Mail:	jbkenworthy@capesystemslimited.com
URL:	www.islandschool.org
Represented by:	Jack Kenworthy
Salutation:	Mr
Last Name:	Kenworthy
First Name:	Jack
Mobile:	U.S Cell: 484-467-5315
Direct tel:	*242-557-7612*
Personal E-Mail:	jbkenworthy@capesystemslimited.com

Organization:	Pioneer Carbon Ltd
Street/P.O.Box:	POBox 856
Building:	Eden Square Business Centre, Westlands Rd
City:	Nairobi
State/Region:	Africa
Postfix/ZIP:	00606 Nairobi
Country:	Kenya
Telephone:	+254 203 673 183
E-Mail:	tom.morton@pioneercarbon.com
URL:	www.pioneeercarbon.com
Represented by:	Tom Morton
Salutation:	Mr
Last Name:	Morton
First Name:	Tom
Mobile:	+254 728 218 183
Direct tel:	+254 203 673 183
Personal E-Mail:	

Annex 2

BASELINE INFORMATION

A2.1 Methodology for calculation of GHG emission reductions from UCO bio-diesel

1. **Key features**

The project follows the CDM approved methodology AM0047 *Production of waste cooking oil based bio-diesel for use as fuel. Version 01.* By inference it draws on the sources quoted for the methodology, namely:

- approved methodology ACM006
- new methodologies NM0082-rev [recommended A case 20th meeting of the Meth. Panel],
- NM0108-rev
- NM0142 [recommended B case 20th meeting of the Meth. Panel].

The methodology applies to production and use of bio-diesel from used cooking oil (UCO) or similar non-fossil and bio-degradable feedstocks. An essential requirement for its application is that the fuel displaced by the bio-diesel is petro-diesel.

The methodology requires that emission reduction credits are assigned only to producers of the bio-diesel and not to consumers, in order to avoid the risk of double-counting. It is also required that the engines using the bio-fuel are "captive" in the sense that the fuel is not used outside the project boundary; in general this condition is secured by ascertaining that all the bio-diesel is blended within the project boundary.

The methodology considers the presence of green house gases other than CO2 in the baseline, project, and leakage scenarios to be negligible, and therefore only CO2 is presented in application of the methodology.

The baseline emissions taken into account by this methodology are the CO2 emissions from combustion of the displaced petro-diesel. The ancillary CO2 emissions associated with extraction, refining, and transport of the displaced fossil-fuel are not taken into account in order to ensure that the green-house gas reductions induced by the project, are calculated conservatively.

The project emissions considered are the CO2 emissions resulting from the fossil-carbon component of the bio-diesel resulting from use of methanol in its production through trans-esterification, together with any emissions associated with the production process itself (such as from use of electricity and other fuels or energy sources).

The calculation also takes into account the emissions associated with manufacture and transport of the methanol, and the transport of feedstock to the processing plant as well as the transport of bio-diesel to the blending stations and to filling stations.

Although the carbon contained in used cooking oil is generally CO2 neutral, the UCO is nevertheless a waste product and care is taken in the methodology to allow for and monitor the possibility of contamination with fossil components. Further there is the prospect that the supply of UCO may not always match the demand for bio-diesel and as a result the processing plant may exceptionally make use of other feed-stocks to produce the bio-diesel. The different emission reduction characteristics of these are taken account of in the methodology.

Two clarifications are made to facilitate the application of the methodology:

a. a utilization factor is included which distinguishes the amount of bio-diesel produced and the amount displacing petro-diesel, since the first value is needed to calculate project emissions and the second to calculate the baseline

b. the emissions reductions that could arise from use of an alternative feedstock to used cooking oil (UCO) are taken into account; this protects against the contingency that bio-diesel demand may out-strip the UCO supply and alternative feedstock may then be added or substituted.

2. Calculations

A. Calculate baseline emissions as follows:

Baseline Emissions

BE,y = Mbd,y . U . NCVbd/NCVpd . EFpd

where

BE,y	Baseline emissions in year y	t CO2
Mbd,y	Mass of bio-diesel to be produced in year y	tonnes
EFpd	Emission Factor (EF) of petro-diesel	tCO2 / t petro-diesel (IPCC default)
U	Utilization ratio	Mass of bio-diesel used in vehicle engines divided by mass produced
NCVbd	Calorific value of bio-diesel	GJ / t
NCVpd	Calorific value of petro-diesel	GJ / t

B. Calculate project emissions as follows:

Project Emissions

PE,y = EE,y + EM,y + Etr,y + Eo,y

where

PE,y	Project emissions in year y	t CO2
Q	Electrical energy consumed in year y	MWhrs
EFe	EF for electricity at facility	tCO2 / MWhr (IPCC default for diesel grid)
EE,y = Q . EFe		t CO2
Qmeth	Volume percentage of methanol in BDF	
SEmeth	Specific energy of methanol	MJ / litre
EF meth	EF for methanol	tCO2 / TJ
EM,y = Qmeth.SEmeth.EFmeth	Methanol emission per gall BDF	tCO2 / gallon BDF produced
Etr,y	Transport emissions in year y	Negligible due to proximity of supply and delivery points
Eo,y	Other Emissions in year y	None

C. Leakage emissions take into account any amounts of UCO used for bio-diesel production which may result in increased use of fossil fuel, as well as the CO2 emissions associated with production of the methanol component of the bio-diesel:

Leakage Emissions

LE,y = Lduco + Lprod.meth

where

Mduco, y	Mass of UCO displaced (stimulating increased use of fossil fuel) in year y	tonnes
EFfduco	EF fuel displaced by UCO	Applies only in cases where Mduco is more than 0
Lduco = Mduco . EFfduco		
Lduco, y	Leakage due to displaced UCO	
Mmeth	Mass of methanol per gallon BDF	kg / gall BDF produced
EFprod.m	EF production methanol	t CO2 / t meth
Lprod.meth per gall BDF = Mmeth . EFprod.meth		Leakage due to Production of methanol per gallon BDF

D. Emission reductions (ER) arising from the project are made up of two components:

a. emissions occurring in the baseline scenario net of emissions arising from the project activity (PE) and net of leakage (LE). Further, any fraction of this net ER resulting from biodiesel exported outside the project boundary, and any fraction of the feedstock containing fossil fuel or not CO2 neutral (including the possibility of non-UCO feedstocks being mixed in or replacing the UCO), is excluded.
b. the emission reductions associated with the “other feedstock” fraction

Emission reductions

ER = (BE - PE - LE) . (1 - Xof - Xex) + ERof		t CO2
where		
Xof	Fraction of other feed-stocks and fossil components of UCO	
Xex	Fraction exported	
ERof	Emissions associated with other feedstocks	t CO2

3. Conservativeness

The methodology is designed to be inherently conservative to eliminate any possibility of emission reductions being over-estimated during the project period. To achieve this, the methodology neglects the positive emission reductions arising from sources such as the following:

- the production (extraction and refining) of the replaced petro-diesel
- the transport of replaced petro-diesel
- decomposition of the used cooking oil (UCO is generally disposed of in land-fill sites or water courses where it contributes to methane emissions)
- the potential that the crude glycerine by-product of the bio-diesel production has to substitute for fossil fuels (for example it can be used as heating fuel for asphalting)

A.2.2. Data, sources, calculation

Baseline Emissions

Mass of bio-diesel to be produced Mbd	tabulated below	tonnes
Density of #2 petro-diesel	0.85	kg/litre
EF petro-diesel EFpd	3.17	tCO2 / t petro-diesel (IPCC default)
Utilization ratio U	1	Mass of bio-diesel used in vehicle engines divided by mass produced
NCVbd	4,013	GJ / t
NCVpd	4,333	GJ / t
BE = Mbd . U . NCVbd/NCVpd . EFpd		

Project Emissions

Electrical energy consumed Q	tabulated below	MWhrs
EFelectricity EFe	0.8	tCO2 / MWhr (IPCC default for diesel grid)
EE = Q . EFe		
Volume of methanol in BDF Qmeth	calculated	
Percentage of methanol by volume in bio-diesel	16%	of BDF volume
Specific energy SEmeth	16	MJ / litre
EF meth	84	tCO2 / TJ
Volumetric units	3.79	litres/US gallon
Methanol emission per gall BDF	0.000814	tCO2 / gallon BDF produced
EM = Qmeth.SEmeth.EFmeth		
Transport emissions Etr	0	Negligible due to proximity of supply and delivery points
Other Emissions Eo	0	None
PE = EE + EM + Etr + Eo		
Leakage Emissions		
Mass of UCO displaced Mduco	0	check
EF fuel displaced by UCO EFfduco	N/a	Applies only in cases where Mduco is more than 0
Leakage due to displaced UCO Lduco	0	Lduco = Mduco . EFfduco
Density of methanol	0.792	kg/litre
Mass of methanol per gallon BDF Mmeth	0.48	kg / gall BDF produced
EF production methanol EFprod.m	1.95	t CO2 / t meth
Lprod.meth per gall BDF = Mmeth . EFprod.meth	0.000935	t CO2 /gall BDF produced
LE = Lduco + Lprod.meth		
Net emission reductions		
Fraction other feedstocks Xof	0	No other feedstocks for substitution or combination
Fraction exported Xex	0	No export
Emissions associated with other feedstocks ERof	N/a	Applies only in cases where Xof is more than 0
ER = (BE - PE - LE) . (1 - Xof - Xex) + ERof		

Year	Production	Displaced	Baseline	Project emissions				Leakage	Emission
	BDF	petro-D	emissions	Electricity	Electricity	Methanol	Total		Reductions
	US galls	tonnes	tCo2	MWhrs	tCO2	tCO2	tCO2	tCO2	tCO2
		Mbd	BE	Q	EE	EM	PE	LE	ER
1	89,910	289	849	50	40	73	113	84	652
2	179,820	579	1,699	75	60	146	206	168	1,324
3	333,000	1,071	3,146	150	120	271	391	311	2,443
4	449,550	1,446	4,247	160	128	366	494	421	3,332
5	499,500	1,607	4,719	175	140	407	547	467	3,705
6	499,500	1,607	4,719	175	140	407	547	467	3,705
7	499,500	1,607	4,719	175	140	407	547	467	3,705
							Total ER		18,866
							Total number of crediting years		7
							Annual average reductions		2,695

The project has been developed on the basis of several years of experience with bio-diesel production on a smaller scale, which has given the production engineers time to quantify energy and materials inputs for production of an accredited quality product. The values given for methanol quantity and electricity consumption are therefore based on the experience of CSL.

Green-house gas emissions associated with transport of the Used Cooking Oil (UCO) feedstock to the processing facility, and from there to the blending and filling stations, are taken as zero since these distances are short in the case of this project, and it is expected that BDF will itself be used.

The methodology allows for the possibility of emissions associated with BDF production, other than those arising from electricity use, transport and the methanol component (these could for example arise from use of heating fuels used to make steam for the production process). In this specific case there are no such other emissions.

Annex 3

MONITORING PLAN

Monitoring will take place in the form of quarterly reports prepared by CSL, based on data provided by Biofuels Bahamas Ltd and Bahamas Waste Ltd, and checked by CSL. The table in section D. 2.2.1 lists the specific parameters to be monitored together with details as how the data is sourced. The monitoring and reporting protocol includes provision for cross-checks by CSL as indicated on the table.

The table includes both parameters effecting the emission reduction calculations and parameters affecting the sustainable development matrix score (as discussed in more detail in Section A introducing the matrix). In particular the water quality indicator is monitored quarterly, while other sensitive indicators are monitored and reported annually.

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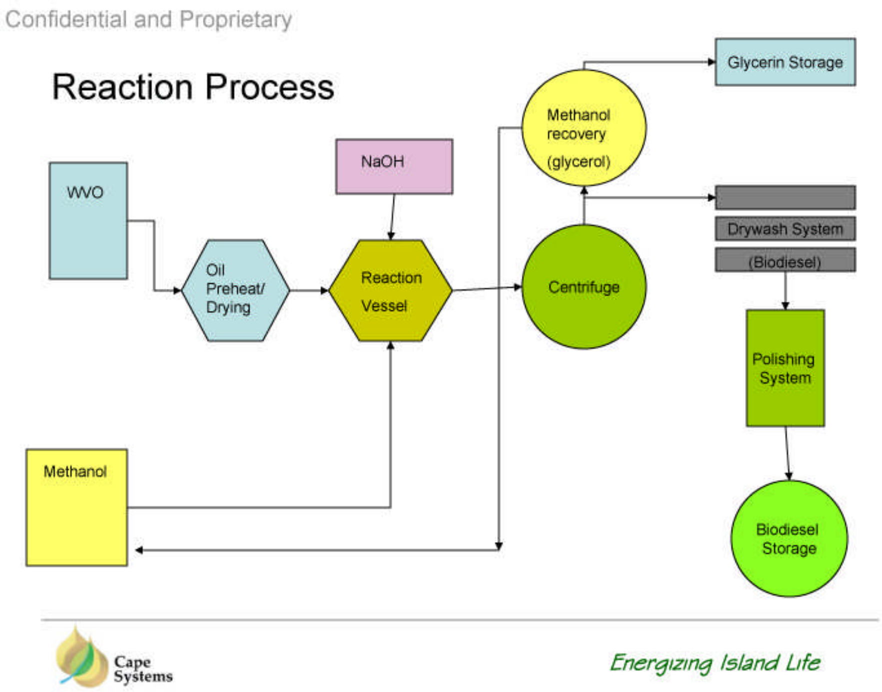
Annex 4

Technical Description of Process



The process will involve a single-stage trans-esterification reaction using a base catalyst. Clean, dry used cooking oil is reacted at low temperature and pressure (140 deg. F, 13 psi) with methanol and sodium hydroxide to yield fatty acid methyl esters (biodiesel) and a glycerol by-product. The mass flows are as follows:

INPUT	**MASS (Kg)**
Used Cooking Oil	1000
Methanol	170
Sodium Hydroxide	6.8
OUTPUT	**MASS (Kg)**
Methyl Ester	940
Glycerol*	236.8*

The mass composition of the raw glycerol is as follows:

- Glycerin (45%)
- Methanol (20% - of which 90% will be recovered)
- Soaps (10%)
- Water (10%)
- Salts/Alkalines (8%)
- Biodiesel (8%)

The process begins with the delivery of waste cooking oil to the processing site where it is transferred to bulk storage. When a batch is ready to be processed, it is automatically pumped through a metered pump passing through a waste oil filtration system that removes water and particulates in the oil and into the insulated stainless steel preheat tank inside the processing laboratory. Here the oil is preheated to 140 deg. F. Simultaneously methanol and NaOH are combined in the reactor vessel to yield sodium methoxide. The heated, and cleaned waste cooking oil is then added to the methoxide mixture in the reaction vessel, where it is reacted through a patented process using vortex mixing for approximately 60 minutes. After reaction is complete, the fuel is centrifuged to separate glycerol and methyl ester. The methanol is removed from the glycerol through vacuum distillation, and returned to the methanol bulk storage tank. The remaining glycerol is pumped for storage in 275 gallon totes until final use as heating fuel. Biodiesel is then passed through the ion resin purification system to remove mono and di-glycerides, residual soaps, water and any methanol that may remain. The ion resin is capable of purifying 250 gallons of biodiesel per pound of resin. The resin is disposed of in the sanitary landfill.

Annex 5

Additional Information

Project Description Cape Systems web-site www.capesystemslimited.com "Bio-diesel from Used Cooking Oil, Bahamas: Project Description"

Annex 6

References to Supporting Documents

Confidential and Proprietary

Annex 6.1 Bahamas Biofuel Market Research

Annex 6.2 Bahamas Biofuel Environmental Management Plan (EMP)

Annex 6.3 Bahamas Biofuel CSL.BBL Business Plan 30-03-07

Annex 6.4 Bahamas Biofuel CR800 Cape Systems

Annex 6.5 Bahamas Biofuel Blends above 20 % NBBG 30-11-05

Annex 6.6 Bahamas Biofuel EPA emissions Study

Annex 6.7 Bahamas Biofuel NREL PR-540-38296