JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 05 - in effect as of: 29 May 2007

CONTENTS

SECTION A. General description of the project

A.1. Title of the project:

Sunflower and rape seed – bio diesel fuel production and use for transportation in Bulgaria

Location: SLIVO POLE

Sectoral scope: 1 Energy industries (renewable/nonrenewable)

Version: 5

Date: 2007-05-29

A.2. Description of the project:

The purpose of the project activity is to produce bio-diesel derived from sunflower and rape crops for substituting petroleum diesel. The produced bio-diesel will be distributed on the base of contracts with buyers. These contracts will obligate the buyers to use the bio-diesel only in Bulgaria. The new "Law for stimulating use of RES, AES and bio-fuels" guarantees that the produced bio-diesel will be distributed only in Bulgaria. This law transposes the Directive 2001/77/EC and 2003/30/EC into Bulgarian law.

The reduction of the greenhouse gas (GHG) emissions will be achieved by partially or fully substituting petroleum diesel in transportation. The proposed project aims to reduce GHG in context of JI procedures under the Kyoto Protocol. The project has a capacity of 60,000 tons of bio-diesel per year and is expected to be commissioned in July 2007. The bio-diesel plant will be located in the Rousse Region in the municipality of SLIVO POLE. This region is one of the 28 Bulgarian regions and consists of eight municipalities. The administrative centre is the city of Rousse. Under article 6 of the Kyoto Protocol the proposed Joint Implementation project aims at reducing GHGs by replacing petroleum diesel with bio-diesel. Due to the following facts the project will contribute significantly to the sustainable environmental-socio-economic development of the whole region of Rousse:

Environmental WELL-BEING

The main impact of the proposed project on the environment is the reduction of GHG-emissions. Bio-diesel and other bio-fuels are produced from renewable agricultural crops that assimilate carbon dioxide (CO_2) from the atmosphere while growing. The carbon dioxide released this year from burning vegetable oil will be used next year by crops growing. In comparison with petroleum diesel, the bio-diesel is clean, safe, biodegradable and free of sulphur. Combustion of bio-diesel reduces serious air pollutants such as soot, particulates, carbon monoxide (CO), hydrocarbons and air toxics. Hence use of bio-diesel is

environmentally safe and reduces not only global GHG-emissions, but also local air pollution.

In the region, where the proposed plant will be built and where the required feedstock will be cultivated irrigation systems exist that are currently unused. The proposed project will revive the existing irrigation systems. Those systems will stimulate not only the growing of oilseed plants but also the growing of traditional vegetables, which had been cultivated in the past. All those circumstances will improve positive environmental impact in the Rousse region.

Social and economical WELL-BEING

The social impact of the project contains the creation of new jobs and the improvement of the present income situation of local farmers. 120 persons will be employed in the bio-diesel production plant. In addition, 30 farmers will be working on the cultivation of oilseed plants.

The plant will contribute to the economic development of the area in which it is located too. These impacts comprise the use of bio-diesel for urban transport in Rousse and in neighboring regions. Additionally, the infrastructure and the transport system can be improved and developed. By-products (mainly glycerin) will be sold to the local potential consumers and national market.

ASTRA BIO PLANT Ltd. will use the produced bio-diesel within the region to run its own as well as the transport fleet of ASTRA FINANCE Ltd. BULMARKET DM Ltd., one of the leading Bulgarian fuel wholesalers, will also run its agricultural machinery with Astra's bio-diesel. BULMARKET DM Ltd. owns the fuel depot in the City of BYALA with a capacity of 7,500 tons. The dispenser for the Rousse region is planned to come from that depot, which will also lead to more employment within the region. BULMARKET DM Ltd. will dispense the produced bio-diesel to Bulgarians biggest fuel distribution companies as LUK OIL Ltd., PETROL Ltd. and OMV Ltd. In addition, local transport companies like OVANESOVI, SHANS 99 and KRAKRA 50 will use the produced bio-diesel.

The project will also reduce Bulgaria's dependence on imports of crude oil and thus has a positive effect on the trade balance. At present Bulgaria imports over 70 % of the fuel required for energy production and is interested in developing indigenous resources.[1] Considering that approximately 90 % of the country's land is arable, agricultural land or forests the potential for the development of biomass projects is promising.

[1] Renewable Energy Initiative, http://www.ebrdrenewables.com/sites/renew/countries/Bulgaria/default.aspx, status: 2006-09-01

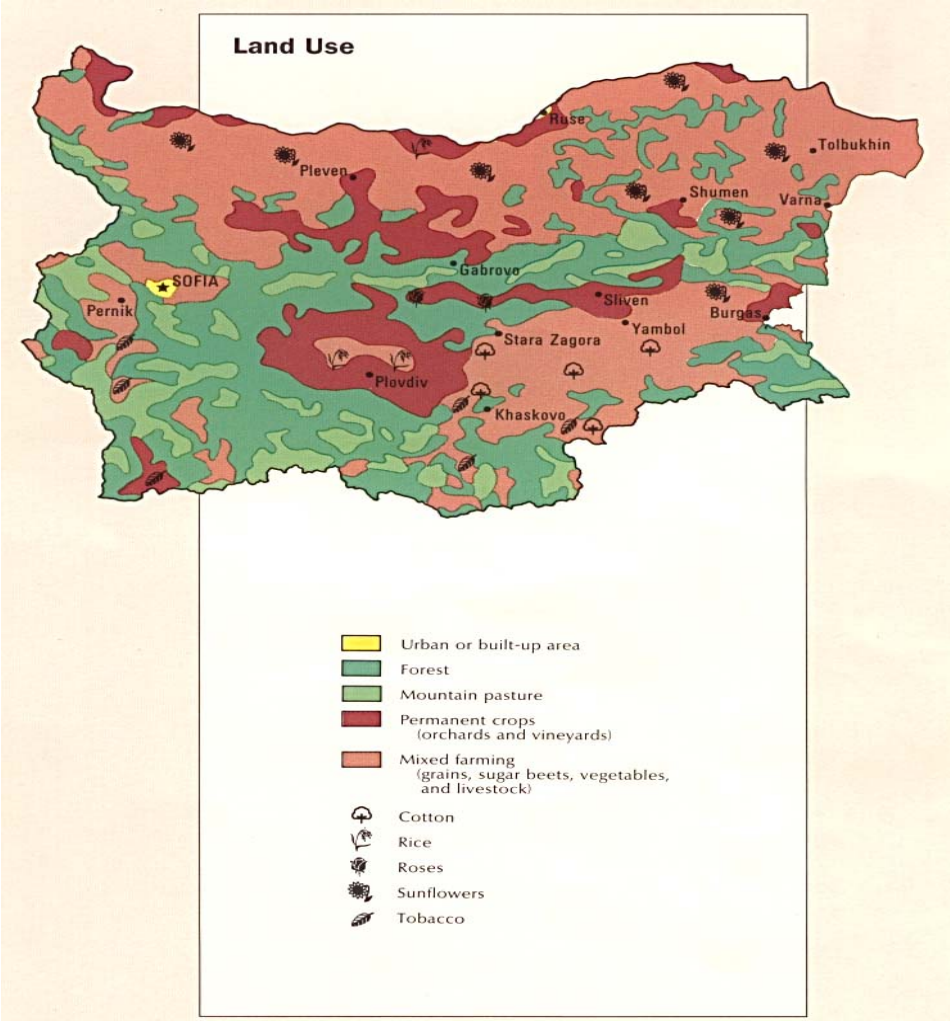


Illustration 1: Land use in Bulgaria

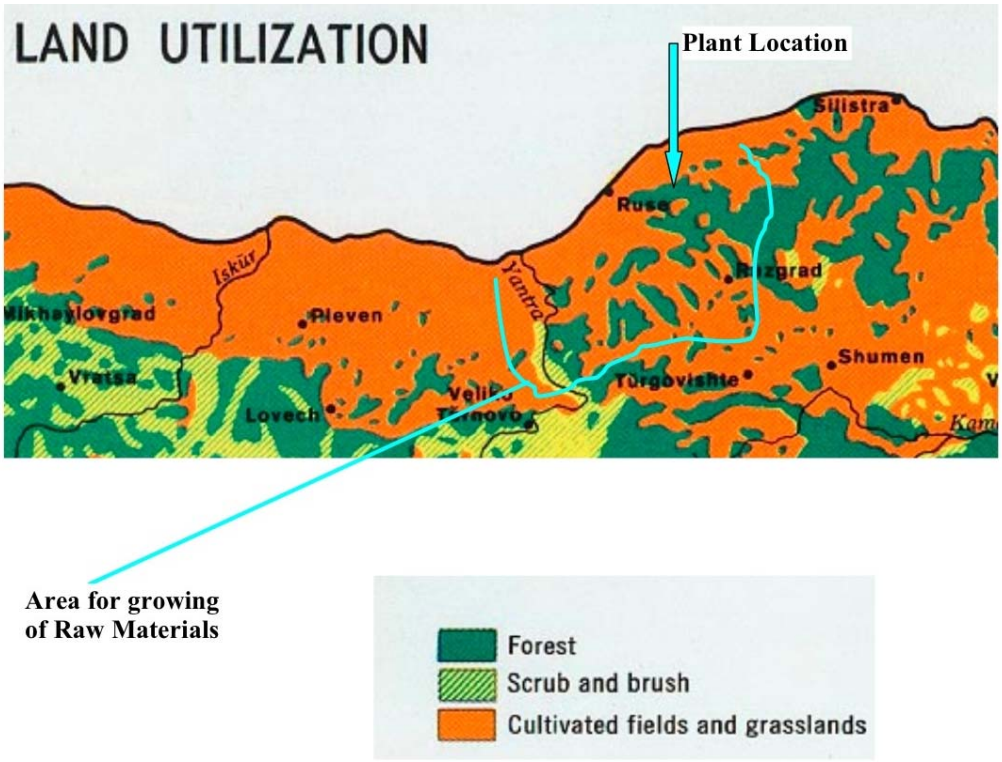


Illustration 2: Land utilization in the area around the plant

Date	Description of the Document and Action	Number
22.02.2006	First version of PIN sent by ABP to MOEW	188-21/02/06
17.03.2006	Letter from MOEW to ABP with request for improvement of the PIN	26-00-587
24.03.2006	Second version of PIN sent by ABP to MOEW	
01.04.2006	Announcement in the local newspaper UTRO – Notification for Investment in the area of the municipality	
03.04.2006	Letter from ABP to the mayor of SLIVO POLE – Notification for Investment in the area of the municipality	1527-03/04/06
04.05.2006	Standpoint by MOEW on the second version of PIN	
12.05.2006	Notification Letter for Investment intend	A02079
25.05.2006	Standpoint by MOEW – Branch Rousse on the Notification Letter	1860
May 2006	LETTER OF SUPPORT by MOEW	26-00-587
Oct. 2006	Construction Permit of Municipality	
Nov. 2006	Start of the project	
15.06.2007	Plant permission of Complex Building Permission will include EIA	
01.07.2007	Estimated start of production bio-diesel	

Table 1: Time schedule

The risk that the beginning of the operation will be delayed can't be excluded completely, because the complex building permits (IPPC) and the approved EIA are not available yet.

A.3. Project participants:

Party Involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Bulgaria (Host Party)	ASTRA BIO PLANT Ltd. 100 TUTRAKAN Boulevard 7000 Rousse, Bulgaria	No

The project is a result of the partnership between "Regional Energy Consultancy Centre Euro GIS Project – Rousse" Ltd. (Co-author) and the local business company "ASTRA BIO PLANT Ltd." (plant owner).

ASTRA BIO PLANT Ltd.

The company was incorporated with Decision No. 2601/ 17.11.2005, company case No. 1061/ 2005 of the District Court of Rousse, volume 160, page 107. Mrs. TEMENUGA DIMITROVA STANKOVA, General Manager, represents the company. Its seat and registered address is 7000 Rousse, 100 TUTRAKAN Blvd. ASTRA BIO PLANT Ltd. was founded for this project, 100 % owned by ASTRA FINANCE Ltd. (see below). Mr. Vasil Ganev is a technical manager of ASTRA BIO PLANT Ltd. He supports BULMARKET DM Ltd. (see below) as a consultant as well.

ASTRA FINANCE Ltd.

ASTRA FINANCE Ltd. has been registered in the year 2000. The main business of the mother company is the trade with agricultural products, fertilizers and fuels. Buildings for storing grain and fertilizers are licensed. The capacity is about 60,000 tons. ASTRA BIO PLANT Ltd. was established by ASTRA FINANCE Ltd at the end of 2005. The reason to establish the company in the region of SLIVO POLE was the high unemployment rate (tax advantages for hiring employees in this area, no corporate tax). ASTRA FINANCE Ltd. bought land for the production plant, which are important assets to ASTRA BIO PLANT Ltd.

BULMARKET DM Ltd.

BULMARKET DM Ltd. is a 100 % private Bulgarian enterprise that was established in 1996.The seat of the company is 7000 Rousse, 100 TUTRAKAN Blvd. The company's main business is the distribution

of LPG and to a less considerable degree of natural gas, gas oil, petrol and other fuels. Since 1998 BULMARKET DM Ltd. has proved to be a key player on the LPG market in Bulgaria with approximately 15-20 % share in the wholesale trading.

Above companies are separate juridical bodies.

Illustration 3: Project actors

The PDD was prepared by KWI Consultants GmbH.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

Bulgaria

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

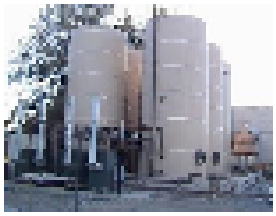
Illustration 4: Location of Rousse region in Bulgaria (in red)

Illustration 5: Map of Rousse region

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

City of SLIVO POLE, 23 Bulgaria Blvd, Municipality of SLIVO POLE

Rousse region



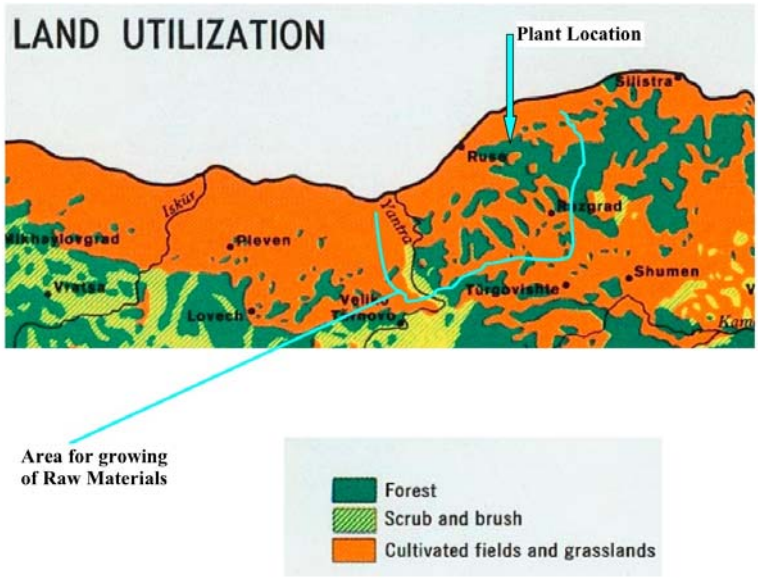


Illustration 6: Aerial map around of the city of SLIVO POLE

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

The project activity involves the production of bio-diesel derived from sunflower and rape seeds for substituting petroleum diesel. The production will take place in a plant located in the City of SLIVO POLE, Rousse region. Rousse region is one of the 28 Bulgarian regions. The Region of Rousse consists of eight municipalities: Rousse, BYALA, IVANOVO, TZENOVO, BOROVO, SLIVO POLE, DVE MOGILI and VYATOVO. The administrative centre is the city of Rousse with 162,131 inhabitants.

The north border of the region coincides with the state border and is along the Danube River. Two European transport corridors ensure the connection between Baltic and North Sea regions on one hand, and Mediterranean and Black sea on the other. The geopolitical situation of Rousse region gives wide opportunities for cross border cooperation in the context of the European regional policy, as well as with neighboring regions. Since the year of 2000, the region is administrative centre of "The North Central Planning Region" including the regions of Rousse, Pleven, Veliko Tarnovo, Gabrovo and Lovech.

The economy of Rousse region has a relatively balanced branch structure, which is close to the national structure. The regional economy has started a period of growth. The signals for that come from the data for GDP per capita and investments. The industrial sector has the biggest growth potential. The driving forces for the growth in production volume are increasing export opportunities. The enterprises intensively modernize their production facilities and use the export opportunities more and more. The

address of the plant is: ASTRA BIO PLANT Ltd. 7060 City of SLIVO POLE, 23 Bulgaria Blvd.

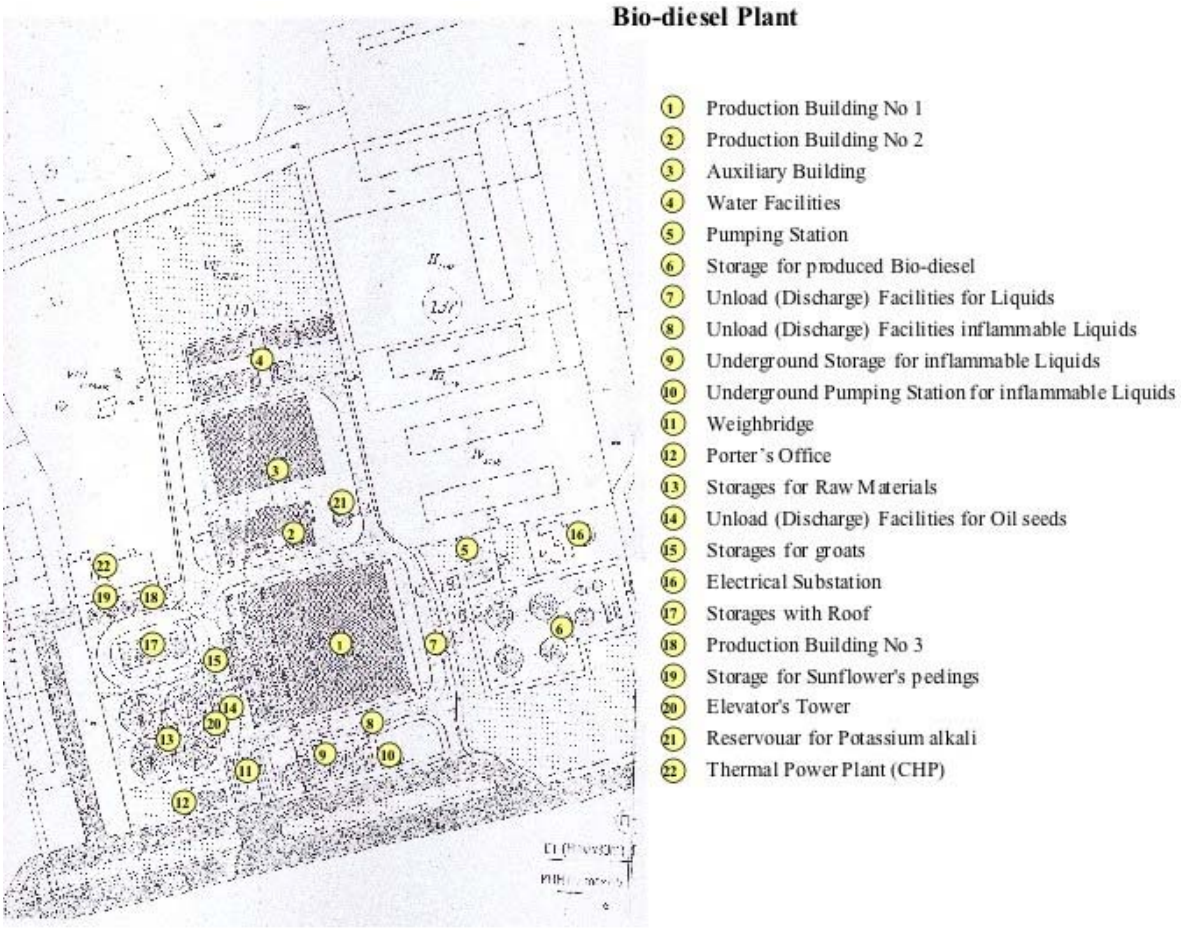


Illustration 7: Bio-diesel plant's facilities

Property No: 1158 (location according to the Cadastral map issued by the Bulgarian Ministry of Regional Development and Town-planning scheme):
Quarters: VIII-1158; VII-1158, part 119; I-1158; II-1158; III-1158; iV-1158,part 136; V-1158; Vi-1158
Facilities: Former preserved food factory – not in use

Neighborhood properties and facilities:

On the West: Property No 1103; 1104 and 1183
Facilities: Old buildings – not in use
On the North: Property No 1087 and 1092
Facilities: One family house 200 meters from the plant
On the East:
Facilities: Only field
On the South:
Facilities: Main road Rousse – Silistra and field

On the North: Property No 1177

Facilities: Only field

A.4.2. Technology (s) to be employed, or measures, operations or actions to be implemented by the project:

As a result of thorough researches and visits to bio-diesel plants in the Czech Republic and the Slovak Republic, as well as contracting foreign project consultants, ASTRA BIO PLANT Ltd. came to the decision to purchase a modular type of plant that will lead to optimized activities, to develop and modernize production and in future increase the capacity by purchasing and installing other production modules.

The proposed bio-diesel plant will produce bio-diesel according to the requirements of the Norm DIN EN 14214 (equivalent to Bulgarian BDS EEM 14-214) and will have the following content:

№	PARAMETERS	Minimum	Maximum
1	Ester content (% m/m)	96.5	-
2	Density at 15° C g/cm^3	0.86	0.90
3	Viscosity at 40° C mm^2/s	3.5	5.0
4	Flash point ° C	> 120	-
5	Sulphur content %	-	0.01
6	Carbon residue of (10 % mm)	-	0.30
7	Cetane number	51.0	-
8	Sulfate ash content (%)	-	0.02
9	Water content (mg/kg)	-	500
10	Total contamination (mg/kg)	-	24
11	Corrosion copper band (3 h at/50° C)	1	1
12	Oxidation stability at 110° C	6	0
13	Acid value (mg KOH/g)	-	0.50
14	Iodine value	-	120
15	Linoleum Acid Methyl ester (5 m/m)	-	12
16	Methanol content (% m/m)	-	0.2
17	Free Glycerol (% m/m)	-	0.020
18	Monoglycerides (% m/m)	-	0.80
19	Diglycerides (% m/m)	-	0.20
20	Triglycerides (% m/m)	-	0.20
21	Total Glycerol (% m/m)	-	0.25

22	Alkaline metals (Na + K) mg/kg	-	5
23	Other metals content (Ca + Mg) mg/kg	-	5.0
24	Phosphorus content mg/kg	-	10.0

Table 2: BDS EEM 14-214

To meet the requirements of the norm DIN EN 14214 (equivalent to Bulgarian BDS EEM 14-214) the following technology will be used:
Three main steps are necessary for the production of bio-diesel from rape and sunflower seeds.

The first step is to produce crude oil from the raw material (rape and sunflower seed). The extraction of the raw material process, which takes place in the extractor, includes the use of hexane. The liquid path within the extraction plant is as follows: Fresh hexane is pumped from the hexane storage tanks over the solvent/water separator into the plant. From the solvent/water separator the hexane enters the solvent working tank from where the hexane is fed by the fresh hexane pump over a shower to the extractor. After further processing, the remaining hexane is removed by indirect heating and addition of stripping steam. The hexane phase flows by gravity to the solvent working tank which is equipped with the conical bottom. Fresh hexane is taken out from this tank by the fresh solvent pump of the extractor at an elevated level so that eventually contained traces of water settles in the conical bottom from where it is returned by the water-return pump to the solvent/water separator. The water phase from the water/solvent separator goes by gravity to the waste-after-evaporator, where by the injection of live steam traces of hexane are driven off. The wastewater leaving this wastewater boiler will have only traces of residual hexane and can be piped via wastewater security pit directly into the sewer system. The solvent working tank has an overflow to the underground hexane storage tanks since the capacity of the working tank is not big enough to take up all the solvent coming out of the plant when the plant is being stopped.
The oil press residue will be sold as fertilizer or fodder or fertilizer back to farmers in the region.

Bio Diesel Plant - City of "SLIVO POLE" - Rousse Region - Bulgaria

1. Production of Crude Oil from Oil Seed - Technological Flow Chart

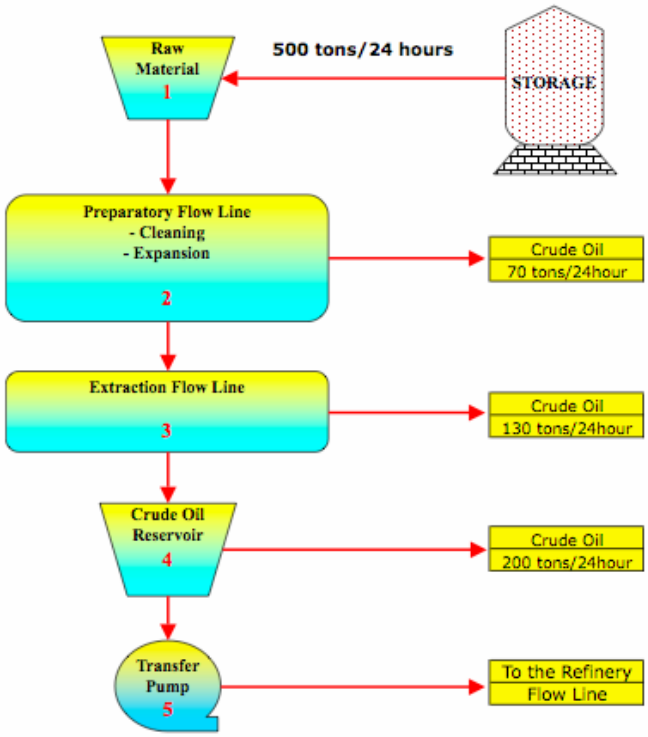


Illustration 8: Production of crude oil form oil seeds - Technology chart

Processing 500 tons/24 hours sunflower seed:

- 200 tons crude oil – 40 %
- 75 tons sunflower peelings – 15 %

- 35 tons water by 7 % humidity
- 10 tons foreign materials by – 2 %
- 180 tons groats – 36 %

The second step is the hydration and neutralization of the crude oil together with phosphoric acid, water and sodium hydroxide. After bleaching and deodorization, the second step is completed with the refined sunflower and rape oil as main output. In case of emergency there is the opportunity to purchase crude oil from the national market.

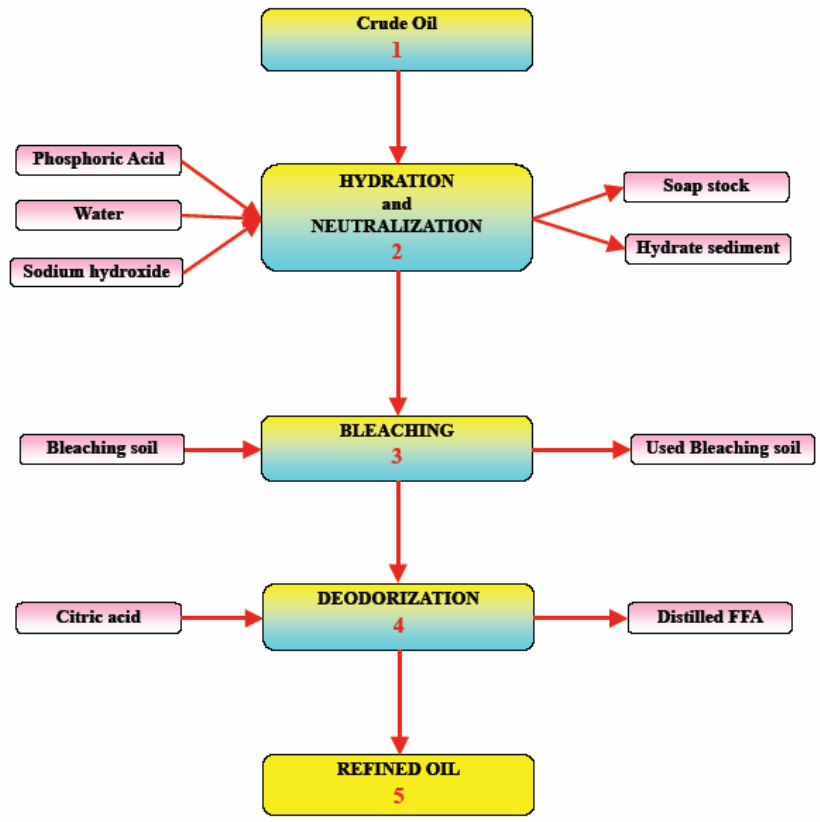


Illustration 9: Refinery flow line – Technology chart

The third step involves the core technology of pre-esterification. Sunflower/rape oil and methanol react (with sodium hydroxide under heating) to bio-diesel and glycerin. After the esterification process, desorption process follows, where the two components bio-diesel and glycerin are separated. After neutralization (with phosphoric acid and sodium hydroxide), washing, drying and filtering the end product is the clean bio-diesel.

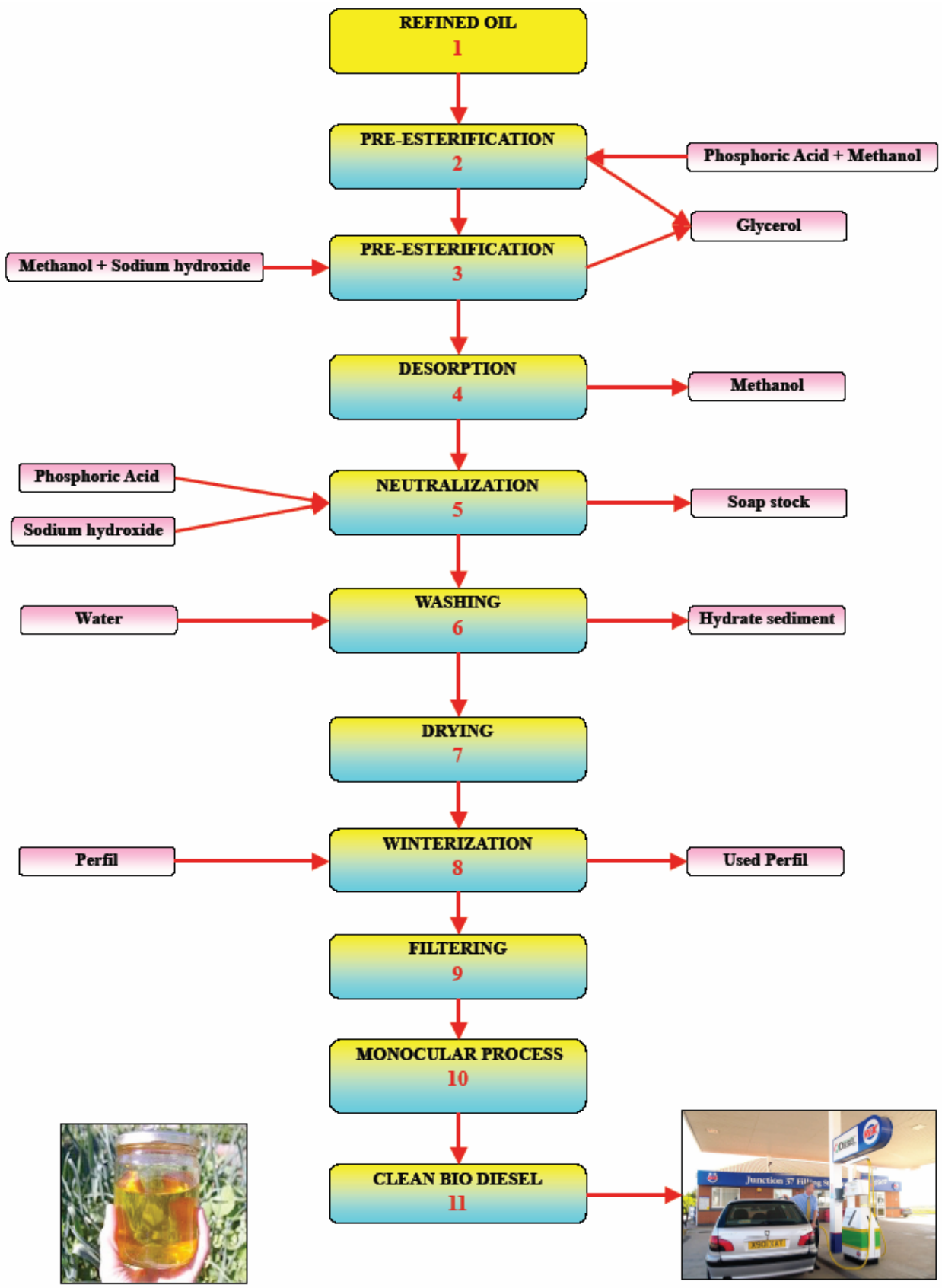


Illustration 10: Production of bio-diesel – Technology chart

The main output of ASTRA bio-diesel plant is bio-diesel and glycerin. For the glycerin ASTRA BIO PLANT Ltd. has three opportunities to exploit:

1. ASTRA BIO PLANT Ltd. uses the glycerin to produce the necessary heating for the process and to heat the building.
2. ASTRA BIO PLANT Ltd. delivers the glycerin to the local heating plant and they use it instead of heavy fuel.
   In any of this case the emissions are calculated, because the emissions during the cultivation and the emissions for the methanol are counted.
3. ASTRA BIO PLANT Ltd. could reprocess the glycerin to a higher quality and sell it to the medicine or cosmetic industry.
   In this case the CO_2-emissions will be reduced, because the carbon content from the glycerin is removed from the system. The same carbon content of glycerin and methanol leads to the situation a reduction of the purchased methanol by the glycerin sold in the emission calculation. As buy-product ASTRA get a fertilizer K_2SO_4. This fertilizer will also be purchased to local farmers.

Bio-diesel fuel as the end product can be used pure (100 % bio-diesel for the ASTRA BIO PLANT Ltd. owned trucks) or will be blended with petroleum diesel from 2 to 5 volume units and will be used as mixed fuel like B5 or B 10. That mixture reduces air pollutants such as particulate matter (PM), polycyclic aromatic hydrocarbons (PAH), carbon monoxide (CO), sulphur oxides (SO_x) etc. in comparison to petroleum diesel. Pure bio-diesel fuel has a more pollutant reduction effect than the mixture. Substituting petroleum diesel GHG-emissions will occur through the substitution of petroleum diesel, currently used as energy source, with bio-diesel fuel that will be produced in the ASTRA BIO PLANT Ltd. CO_2-emission will reduce the reduction of, because combusting of bio-diesel fuel can be counted as zero or “carbon neutral” under IPCC guidelines.

In all contracts between ASTRA BIO PLANT Ltd. and other companies trainings of the employees are stated explicitly:

Training of the operational staff:

Five operators and a mechanic are already employed by ASTRA BIO PLANT Ltd. and they work together with the employees of BIOENERGOMASHPROJECT Ltd.

In the contract between ASTRA BIO PLANT Ltd. and BIOENERGOMASHPROJECT Ltd. is noted

- In chapter "Rights and Obligation of BIOENERGOMASHPROJECT Ltd.", page 5, clause (6) that BIOENERGOMASHPROJECT Ltd. has "to train specialists employed by ASTRA BIO PLANT Ltd. to work with the installations."
- In chapter "Rights and Obligation of ASTRA BIO PLANT Ltd.", page 6, clause (5) that ASTRA BIO PLANT Ltd. has to provide to BIOENERGOMASHPROJECT Ltd. own specialists for training by the BIOENERGOMASHPROJECT Ltd."

Workshop:

In the workshop three employees will work – an electrician, a fitter and a mechanic. Responsible for workshop will be the Chief Engineer.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

Anthropogenic greenhouse gas (GHG) emissions will be reduced by partially or fully substituting the combustion petroleum diesel by combustion bio-diesel fuel as described in Section A.4.2.

Currently, petroleum diesel is used for transportation, which leads to a number of irreversible consequences for the environment. Hence numerous international agreements require the reduction of the contamination of the atmosphere, soil and water. It is anticipated that the bio-diesel project will produce around 200 tons of bio-diesel per day or 60,000 tons per year and will lead to a reduction of about 130,000 tons of CO_2-emissions per year (emissions reductions are proportional to the quantity of petroleum diesel substituted by the bio-diesel consumed by transport vehicles.)

Distribution of bio-diesel:

The produced bio-diesel will be distributed only in Bulgaria according to the agreement between ASTRA BIO PLANT Ltd. (producer) and BULMARKET MD Ltd. (wholesaler), dated 18.12.2006. The obligations of BULMARKET are pointed out in Chapter I; Article 1 of the above mentioned agreement. The new "Law for stimulating use of RES, AES and bio-fuels" guarantees that the produced bio-diesel will be distributed only in Bulgaria. This law transposes the Directive 2001/77/EC and 2003/30/EC into Bulgarian law.

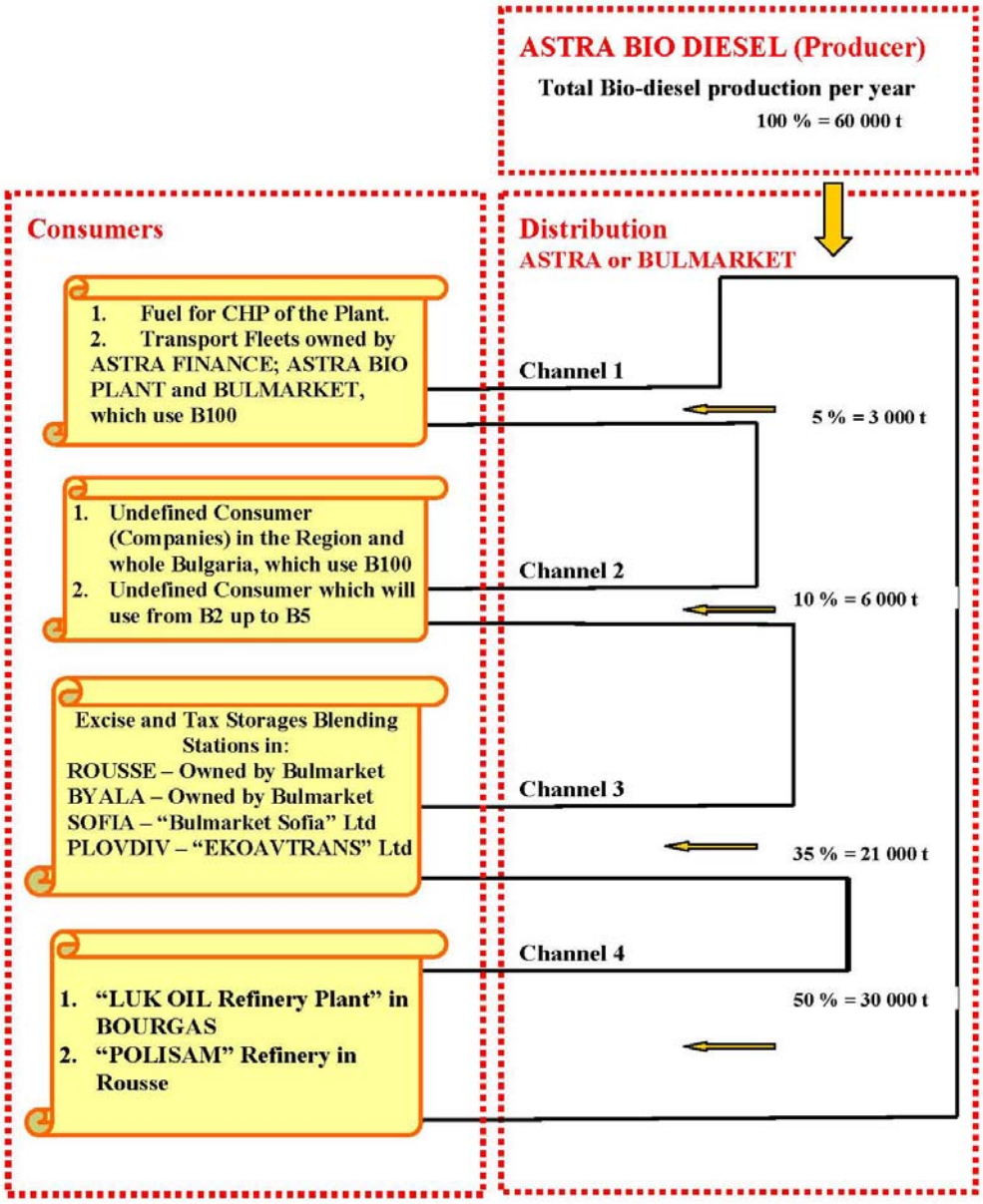


Illustration 11: Distribution Flow Chart

The "Distribution Flow Chart" clearly describes the channel of distribution and the quantity of bio-fuel that will be sold.

The following identified consumers will use the produced bio-diesel:

- Transport fleet owned by ASTRA FINANCE Ltd.
- Transport fleet owned by daughter companies of ASTRA BIO PLANT Ltd.
- Transport fleet owned by daughter companies of BULMARKET DM Ltd
- Agricultural machinery taking part in the process of cultivation, transportation etc. owned by BULMARKET DM Ltd.

Potential identified companies:

Several transport companies located in the City of Rousse and Rousse region:

- Company "OVANESOVI" – 36 buses
- Company "SHANS 99" – 30 buses
- Company "KRAKRA 50" – 25 buses

Fuel depot and blending stations:

- BYALA – BULMARKET DM Ltd. with a capacity of 7,000 tons
- ROUSSE – BULMARKET DM Ltd.
- SOFIA – BULMARKET Sofia Ltd.
- PLOVDIV – EKOAVTRANS Ltd.

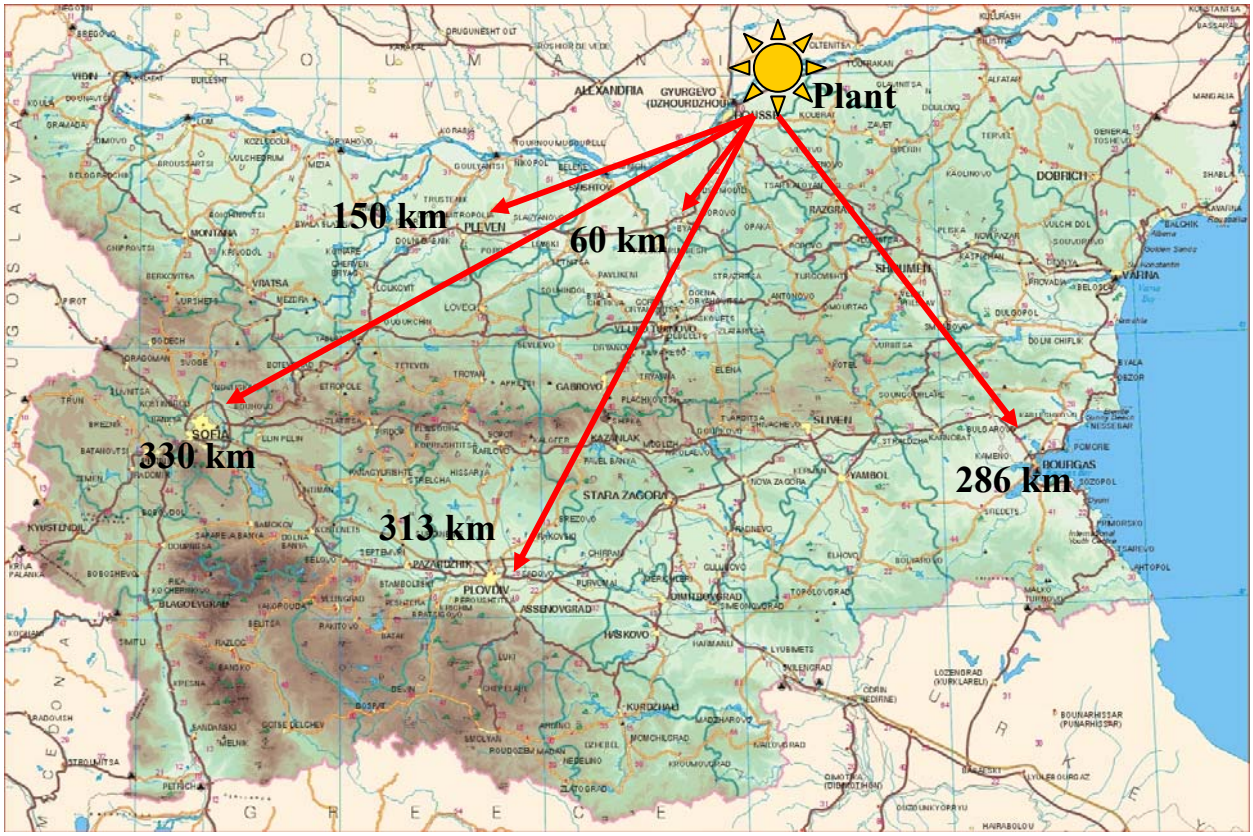


Illustration 12: Map of the geographic boundaries for the distribution

Refineries:

BULMARKET DM Ltd. will dispense the produced bio-diesel to Bulgarians biggest fuel distribution companies as LUK OIL Ltd., POLISAM, PETROL Ltd., OMV Ltd. and others.

Unidentified consumers:

BULLMARKET sells B2, B5 or B100 bio-diesel to the following unidentified consumers via ten BULMARKET-owned petrol stations:

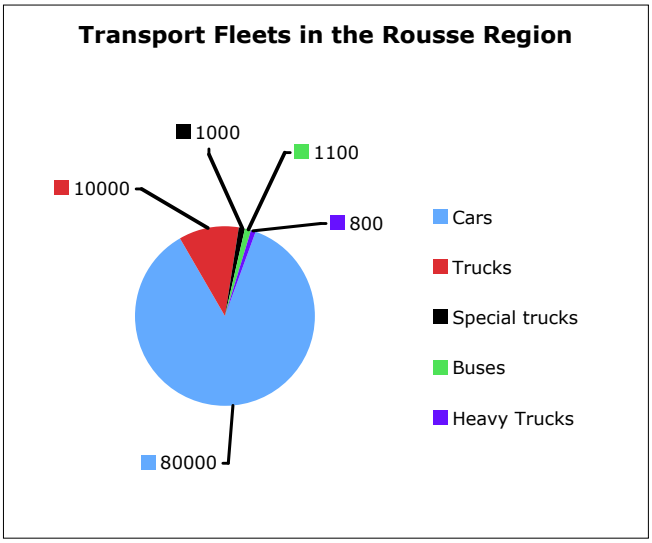


Illustration 13: Transport fleets in the Rousse region[2]

Approximately 40 % of the transportation vehicles are diesel driven, which means they are potential unidentified consumers for ASTRA BIO PLANT Ltd. in Rousse region.

Agreements:

1. Agreement between BULMARKET and ASTRA BIO PLANT Ltd. is signed.
2. Agreements between BULMARKET and "EKOAVTRANS" Ltd., PLOVDIV, BULMARKET Branch Sofia Ltd. and "POLISAM" Ltd. Rousse are signed.
3. Agreements between BULMARKET and LUK OIL refinery plant is in negotiation process.
4. Agreements between BULMARKET and potential consumers (mainly transport companies) are in progress.

The Bulgarian Ministry of Economy and Energy is working on a "Law to encourage production, distribution and use of bio-fuels". It aims the elimination of the excise duties on bio-fuels in a mixed form. So far fuel as a mixture of normal and bio-diesel was subject to excise duty as pure diesel, while bio-fuels are exempted from excise duty in Bulgaria. With the new law such percentage equal to the percentage of bio-diesel that it contains will reduce the excise duty of mixed fuel. The adoption of the law is expected for 2007.

[2] Regional Police Transport Department

A.4.3.1. Estimated amount of emission reductions over the crediting period:

	Years
Length of crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO2 equ.
2008	134.544
2009	135.423
2010	135.681
2011	135.745
2012	135.824
Total estimated emission reduction over the period (tonnes of CO2 equ.)	677.216
Annuale average of estimated emission reductions over the crediting period (tonnes of CO2 equ.)	135.443

Table 3: Estimated amount of emission reductions

In the year 2007 the emissions will be reduced by approximately 66.877 t CO_{2e}.

A.5. Project approval by the Parties involved:

The Bulgarian Ministry of Environment and Water[3] (MOEW) fully supports the proposed project "Sunflower and rape bio-diesel fuel production and use for transportation in Bulgaria" and has endorsed the project as a Joint Implementation project. The Letter of Support can be found in Chapter B 2 of the PDD.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

The existing situation in Bulgaria is the consumption of petroleum diesel in the transport sector. The combustion of petroleum diesel involves GHG-emissions as well as other air pollutants. The project scenario is to produce bio-diesel, pure or mixed with petroleum diesel fuel, and use it as an alternative to petroleum diesel in Bulgaria.

The reduction of anthropogenic emissions of GHGs will occur on the one hand through the substitution of petroleum diesel with bio-diesel. GHG-emissions are reduced corresponding to the amount of

[3] http://www.moew.government.bg/index_e.html

petroleum diesel substituted by bio-diesel, as those emissions are defined as "carbon neutral" under IPCC guidelines (only the combustion of bio-fuel is carbon neutral). On the other hand the pre-combustion emissions (emissions during production process) will be also substituted.

The appropriate baseline scenario that represents the GHG-emissions in the absence of the project activity is the continuation of existing practice of production and using the petroleum diesel in transport sector.

In compliance with Directive 2003/30/EC the Bulgarian Ministry of Economy and Energy is working on a "Law to encourage production, distribution and use of bio-fuels". The law already passed the first reading by the Bulgarian Parliament. At present, the law is under second reading in the Energy Committee, which should be finalized in the calendar weeks 20-21/2007. The final voting by the National Assembly of the Republic of Bulgaria is expected by the end of June 2007. The law will provide all necessary information on how bio-fuels (production, distribution or demand) are subsidized in Bulgaria or otherwise supported.[4]

For the calculation of baseline emissions the following two steps are necessary:

- Methodology to estimate the amount of bio-diesel produced by ABP (Calculation and Check 1-4)
- Calculation of baseline emissions

1. Methodology to estimate the amount of bio-diesel produced by ABP

Basis of the calculation is the total amount of sold bio-diesel by ABP:

BD_{sold}: Name: Total amount of sold bio-diesel by ABP
Unit: t
Source: Sale recording data of ABP
(Conversion from t in m³ with the value NCVbdf)

Starting from the total amount of sold bio-diesel by ABP, several checks are necessary to estimate the creditable amount of bio-diesel for the baseline emission calculation:

[4] Secretary of the Energy Committee, 1169 Sofia, 1 Kniaz Al. Batenberg Square; status 2007-05-10

Check 1: Countries separation

At first it has to be distinguished between Bulgarian and foreign consumers. Only the amount sold to Bulgarian customers can be used for the calculation of the reduction units. Therefore the address of the consumers has to be monitored or an additional clause concerning the use of the bio-diesel has to be added to the general terms and conditions of the contract. Following that clause the consumers are obliged to use the bio-diesel only in Bulgaria and traders are obligated to sell the bio-diesel only to customers in Bulgaria.

All bio-diesel purchased by Bulgarians is included in the following variable:

$BD_{Bulgarian}$: Name: Bio-diesel sold in Bulgaria by ABP
Unit: t
Source: Sale recording data of ABP

Check 2: Split in distribution channels

The amount $BD_{Bulgarian}$ has to be split in different distribution channels as shown on illustration 9 "Distribution flow chart" of the PDD. The approval delivered by the refineries makes it easy to split up into channel 1-3 and 4. The information delivered in the approval is described later in Check 3.

(BD_1) $BD_{1-3} = BD_{Bulgarian} - BD_4$

BD_{1-3}: Name: Bio-diesel sold in Channel 1-3
Unit: t
$BD_{Bulgarian}$: see Check 1
BD_4: Name: Bio-diesel sold in Channel 4
Unit: t
Source: Monitoring Plan, Annex 2; Approval delivered by refineries

Check 3: Utilization of purchased bio-diesel by refineries

To be able to guaranty that the produced bio-diesel from ABP delivered to refineries will be used in Bulgaria only, an approval of the refineries with the following content is necessary (the information of these approvals is the basis for check 2 and 3): The approval (see annex 2) will be used to collect the necessary information of all refineries under contract.

Approval of refineries: Annex 2

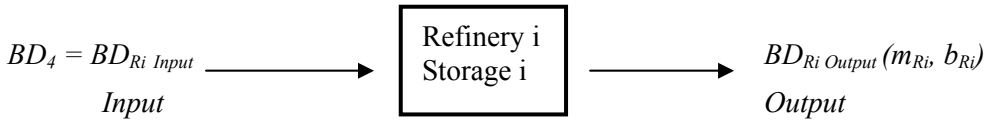
- Name of refinery and location
- Date
- Name and function of responsible representative

- Signature from responsible person
- Amount of bio-diesel delivered to refinery by ABP: BD_{Ri_Input}
- What happened to this amount of bio-diesel (until to combustion)?
- Amount of bio-diesel sold by refinery to consumers in Bulgaria (t): $BD_{Ri\ Output}$

or

- Amount of sold blended diesel to Bulgarian consumers (t): m_{Ri}
- Quality of sold blended diesel to Bulgarian consumers (%): b_{Ri}

For a conservative calculation the following described methodology is in use:



$$(BD_2)\quad BD_{Ri} = (BD_4) = \begin{cases} BD_{Ri\ Input,t} & BD_{Ri\ Input,t} < BD_{Ri\ Output,t} \\ BD_{Ri\ Output,t} & BD_{Ri\ Input,t} > BD_{Ri\ Output,t} \end{cases}$$

BD_{Ri} Name: Conservative amount of bio-diesel of refinery i

Unit: t

$BD_{Ri\ Input,t}$ Name: Amount of bio-diesel sold by ABP to refinery i in year t

Unit: t

Source: Annex 2: Approval delivered by refineries

$BD_{Ri\ Output,t}$ Name: Amount of bio-diesel sold in form of blended diesel by the refinery i in year t

Unit: t

Source: Annex 2; Approval delivered by refineries

(BD_3) $BD_{Ri\ Output} = m_{bld} \times b_{Ri} \times NCV_{PD} / NCV_{bdf}$

m_{Ri} Name: Amount of sold blended diesel of refinery i

Unit: (t)

b_{Ri} Name: Percentage (energetic) of bio-diesel in sold blended diesel, Quality of sold blended diesel of refinery i

Unit: (-)

Source: Annex 2: Approval delivered by refineries

Distribution Chanel	Refinery name	Address	Person	Position	Telephone Number
1	ASTRA BIODISEL PLANT Steam Power Plant	23 Bulgaria Blvd SLIVO POLE	Dimitar Minchev	Plant Manager	+359 82 817421
1	Transport Fleets owned by ASTRA FINANCE, ASTRA BIOPLANT and Bulmarket	100 TUTRAKAN Blvd 7000 Rousse	Deyan Radulov	Transport Manager	+359 82 844861
2	Fuel Stations owned by Bulmarket in the region	100 TUTRAKAN Blvd 7000 Rousse	Vailo Bonchev	Sales Manager	+359 82 844861
3	Excise and Tax Storages Blending Station in ROUSSE	100 TUTRAKAN Blvd 7000 Rousse	Vailo Bonchev	Sales Manager	+359 82 844861

	– Owned by Bulmarket				
3	Excise and Tax Storages Blending Station in BYALA – Owned by Bulmarket	43 V. APRILOV Street City of BYALA	Dosyo Vachkov	Manager	+359 817 7 26 82
3	Excise and Tax Storages Blending Station in SOFIA – "Bulmarket Sofia" Ltd	120 N. MUSHANOV Street	Bilyana Kirilova	Manager	+359 2 822 82 57
3	Excise and Tax Storages Blending Station in PLOVDIV – "EKOAVTRANS" Ltd	212 V. LEVSKI Street	Nikola Zlatarev	Manager	+359 32 967 929
4	LUK OIL Refinery Plant" in BOURGAS	1303 SOFIA 42 T. ALEKSANDROV Blvd	Maring Vazov	Sales Manager	+359 2 91 74 121
4	"POLISAM" Refinery in Rousse	7000 Rousse, 18 PRIDUNAVSKI Blvd	Lyudmil Valkov	Manager	+359 82 828 272

Table 4: List of Defined Consumers and Responsible Persons according to the Distribution Flow Chart

Check 4: Checklist for the amount of emission reductions of the refineries due to the "Law to encourage production, distribution and use of bio-fuels"

In compliance with Directive 2003/30/EC the Bulgarian Ministry of Economy and Energy is working on a "Law to encourage production, distribution and use of bio-fuels". The law already passed the first reading by the Bulgarian Parliament. The final voting by the National Assembly of the Republic of Bulgaria is expected by the end of June 2007. The law will provide all necessary information on how bio-fuels (production, distribution or demand) are subsidized in Bulgaria or otherwise supported.[5]

$$(BD_4) \quad CF_{Ri} = \left\{ \sum_i \left(\frac{b_{Ri} - r_{CG}}{b_{Ri}} \right) \right\}^{1}$$

CF_{Ri} Name: Correction factor due to uncertainty of law

Unit: (-)

Description: As long as any of the questions of check 4 are answered with "NO", the operation of Astra Bio Diesel JI-Project and all its deliveries of bio-diesel to refineries are additional. Only in case that all answers are "YES" the amount of bio-diesel, which has been blended in the refineries supplied by ABP above the average blending of bio-diesel from non JI bio-diesel producers in the refineries of the control group, contributes to emission reductions compared to the baseline.

[5] Secretary of the Energy Committee, 1169 Sofia, 1 Kniaz Al. Batenberg Square; status 2007-05-10

Checklist for the amount BD_{Ri}:

- Check 4.1: Legally valid:
  Law passed the parliament and comes into effect: Yes/No
  Source: Annex 1 Ministry of Economy and Energy Questionnaire

- Check 4.2: Specified Target:
  Does the law specify any targets concerning the blending of bio-diesel with petroleum diesel? Yes/No
  Source: Annex 1 Ministry of Economy and Energy Questionnaire

- Check 4.3: Incentives or penalties:
  Is there a penalty or an incentive for the refineries to reach these targets, which in case of non-compliance with the target results in an severe economic loss or benefit for the refinery compared to compliance (e.g. zero excise tax)? Yes/No
  Source: Annex 2: Approval delivered by refineries

- Check 4.4: Control Groups:
  Is the level of blended bio-diesel with petroleum diesel in a comparable control group of refineries in Bulgaria considerable to the level of the ABP delivered refineries? Yes/No

(BD_5) $b_{Ri} \sim r_{CG}$

r_{CG} Name: Blended bio-diesel in petroleum diesel in control group
Unit: In energetic %
Source: Annex 4: Information by control group
Description: Amount of bio-diesel not produced in the framework of a JI-project and blended with petroleum diesel in the refineries of the control group

Control group definition for bio-diesel:

Under the current legal framework, Bulgaria can continue existing practice of using petroleum. The EC Directive 2003/30 requires the promotion of bio-fuels by blending it with petroleum diesel, but doesn't include any sanctions for the EU members, if they don't follow the directive. As a result of the implementation of the directive 2003/30 in Bulgaria, the refineries could be forced to blend the petroleum diesel with bio-diesel up to a fixed percentage (target), complying with the standards set out in the directive.

In order to be able to monitor the baseline in the ABP project regarding implementation of the directive 2003/30 in Bulgaria, a control group approach has been proposed. The control group, which is a representative sample to the refinery market in Bulgaria, should meet the following criteria:

- The refineries are situated in Bulgaria.
- Private industrial enterprises, which have ongoing operations in Bulgaria
- The refineries sell diesel to the same kind of costumers.
- The refineries sell bio-diesel as blended diesel according to the directive 2003/30 in Bulgaria.
- The refineries are approximately of the same size as the refineries supplied by ASTRA.

Members of the control group:

- Eko-Elda Bulgaria EAD

  Sofia 1040, 36 Dragan Tzankov Blvd

  Tel: + 359 2 8172020, Fax: + 359 2 9733211

  Activities: 1. Trade of petroleum products

  2. Development and operation of a network of gas stations

  www.hellenic-petroleum.gr/online/generic.aspx?mid=170
- Prista Oil

  7012 Ruse, 73 Borisova Street

  Tel.: +359 2 810111, Fax: +359 2 823253

  www.prista-oil.com

  Activities: 1. Manufacture of more than 150 types and grades of lubricants

  2. Sales and marketing of lubricants, greases, coolants, etc.

  3. Distribution and transportation of lubricants

  4. Purchase, storage and sales of base oils

  5. Collection of waste oils

  6. Cleaning of oil spills

  7. Manufacture of starter, traction and stationary batteries

  8. Sales, marketing and distribution of batteries

  9. Collection and recycling of used batteries
- Shell Gas Bulgaria

  1309 Sofia, 117 Zaichar Street

  Tel: +359 2 8237337, Fax: +359 2 8284778

  www.shell.bg

  Activities: 1. Investigation and production

  2. Petrol products

  3. Chemical products

  4. Natural Gas and Electricity

5. Renewable Energy sources

After the "Law for stimulating use of RES, AES and Bio-fuels" has passed the parliament ASTRA will check the suitability of the control group and if applicable will revise the control group.

The control group defined above will be used as a conservative method of monitoring the implementation of the directive 2003/30 of the baseline. The Ministry of Economy and Energy will be approached annually and a written statement requested, which describes the current status of the implementation of the directive across Bulgarian enterprises fitting the defined criteria. When the information of the Ministry of Economy and Energy (Annex 1) states that the directive is being implemented in Bulgaria and bio-diesel – not produced by ABP – sold to refineries in Bulgaria is not arising from any JI/CDM project, then the emission reductions earned by bio-diesel, which was sold to refineries of the project, will no longer be captured.

The questionnaire in Annex 1 will be used to collect the necessary information from the Ministry of Economy and Energy. Annex 2 + 4 provides the necessary information to compare the ABP delivered refineries with refineries in the control group. When this comparison shows that the utilization of bio-diesel in petroleum diesel is common practice, then the emission reductions earned by bio-diesel, which was sold to refineries of the project, will no longer be captured. The questionnaire in Annex 3 will be used to estimate the leakage field emissions associated with the utilization of fertilizer during the crop growing.

Summary of the determination of the amount of bio-diesel fuel:

The above mentioned methodology to evaluate the amount of eligible bio-diesel sold by ABP via distribution channel 1-4 is part of the monitoring workbook and Emission Reduction calculation.

Calculation of eligible amount of bio-diesel sold to customers, filling stations, wholesaler or refineries in Bulgaria per year:

$$(BD_5) \quad BD_y = BD_{1\text{-}3} + \sum_i BD_{Ri} * CF_{Ri}$$

BD_y	**Amount of bio-diesel for calculation of baseline emissions**	**(t)**
$BD_{1\text{-}3r}$	Amount of sold bio-diesel in distribution channel 1-3	(t)
CF_{Ri}	Correction factor because of check 4	(-)
$\sum_i BD_{Ri}$	Conservative amount of bio-diesel delivered to refineries	(t)

2. Calculation of baseline emissions

Baseline Emissions	Unit	2007	2008	2009	2010	2011	2012
$BE_{v,y}$	t	76.992	153.985	153.985	153.985	153.985	153.985
$BE_{BL\_PC,y}$	t	12.116	24.233	24.233	24.233	24.233	24.233
Total Basline Emissions	**t CO_2**	**89.109**	**178.217**	**178.217**	**178.217**	**178.217**	**178.217**
Emissions from combustion of equivalent petroleum diesel by vehicles							
Biodiesel	t/yr	30.000	60.000	60.000	60.000	60.000	60.000
NCV biodiesel	GJ/t	35	35	35	35	35	35
Carbon content of petrodiesel	t C/TJ	20,2	20,2	20,2	20,2	20,2	20,2
Oxidation	t/t	0,99	0,99	0,99	0,99	0,99	0,99
$BE_{v,y}$	t CO2/yr	**76.992**	**153.985**	**153.985**	**153.985**	**153.985**	**153.985**
Precombustion emissions from production of fossil fuels							
Biodiesel	t/yr	30.000	60.000	60.000	60.000	60.000	60.000
NCV biodiesel	GJ/t	35	35	35	35	35	35
NCV petrodiesel	GJ/t	43,33	43,33	43,33	43,33	43,33	43,33
EF for precombustion from productio	t CO2/t	0,5	0,5	0,5	0,5	0,5	0,5
$BE_{BL\_PC,y}$	t CO2/yr	**12.116**	**24.233**	**24.233**	**24.233**	**24.233**	**24.233**

Table 5: Calculation of baseline emissions

Sources of the parameters and variables:

Parameter	Source
Biodiesel	Methodology to estimate the amount of biodiesel produced by ABP
NCV petrodiesel	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Modul 1 Energy; Table 1-3
NCV biodiesel	Laboratory analysis by SGS BULGARIA LTD
Carbon content of petrodiesel	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Modul 1 Energy; Table 1-2
Oxidation	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Modul 1 Energy; Table 1-4
EF for precombustion from production of fossil fuels	Swiss EcoInventory of Energy Systems, 2nd Edition; Vol.1, 1995, p.245

Table 6: Sources of the parameters and variables

Monitoring:

For the calculation of the baseline emissions only two values have to be monitored, the produced and sold bio-diesel by ASTRA BIO PLANT Ltd. and the Net Calorie Value of the bio-diesel from SGS Bulgaria Ltd. by laboratory analysis. The other values are nearly constant along the crediting period, but can also be monitored.

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

Description of the project-scenario:

The project scenario is to produce bio-diesel fuel, pure or mixed with petroleum diesel fuel, and use it as an alternative to petroleum diesel in Bulgaria. The project emissions include CO_2 from fuels and grid electricity that is consumed to operate the bio-diesel plant, plus CO_2 from any fossilized carbon, which bio-diesel contains if fossil fuel is used for trans-esterification.

The following project emissions are identified:

(i) Emissions associated with consumption of electricity

(ii) Emissions associated with reaction of the carbon-content of methanol during trans-esterification

(iii) Emissions associated with transportation of crops or fuels

(iv) Emissions associated with waste water treatment system

(v) Emissions associated with the utilization of hexane

(vi) Emissions reduction by high quality glycerin which is sold to the medicine or pharmacy industry

The details of how each of these project emissions was calculated are described in Section E.

Project emissions are defined by the following equation:

(I) $PE_y = PE_{elec,y} + PE_{MeOH,y} + PE_{TfABP} + PE_{TAC} + PE_{ww} + PE_{Hexan} - PE_{Glycerin,y}$

$PE_{Elec,y}$	from electricity consumption in the bio-diesel plant	(t CO_2)
$PE_{MeOH,y}$	from reaction of fossil carbon contained in methanol	(t CO_2)
PE_{TfABP}	from transport field to Astra Bio Plant	(t CO_2)
PE_{TAC}	from transport Astra Bio Plant to Consumers	(t CO_2)
PE_{ww}	associated with the treatment of waste water	(t CO_2)
PE_{Hexan}	from the carbon content in the used hexane	(t CO_2)
$PE_{Glycerin,y} = 0$	reduction because of the substituted glycerin in other industries This amount is zero because of the conservativeness assumption of calculation.	(0tCO_2)

Description of the baseline scenario:

The existing situation in Bulgaria is the consumption of petroleum diesel in the transport sector. The combustion of petroleum diesel involves GHG-emissions as well as other air pollutants.

The reduction of anthropogenic emissions of GHGs will occur on the one hand through the substitution of petroleum diesel with bio-diesel. GHG-emissions are reduced corresponding to the amount of petroleum diesel substituted by bio-diesel, as those emissions are defined as "carbon neutral" under IPCC guidelines (only the combustion of bio-fuels is carbon neutral). On the other hand the pre-combustion emissions (emissions during production process) will be also substituted. Finally, we get two main emissions for the baseline:

(i) Pro-combustion emissions during production process (Well to tank emission) ($t CO_2$)

(ii) Emissions from the combustion of equivalent petroleum diesel by vehicles (Tank to wheel emission) ($t CO_2$)

The details of how each of these project emissions was calculated separately are described in Section B1 and in the monitoring plan.

(II) $BE_y = BE_{BL\_PC,y} + BE_{v,y}$

$BE_{BL\_PC,y}$	Pre-combustion emissions from production of fossil fuels in the baseline scenario	($t CO_2$)
$BE_{v,y}$	Petroleum diesel consumption by vehicles	($t CO_2$)

Description of the leakage emissions:

The project participants quantified increases in emissions outside the project boundary due to

(i) pre-reaction emissions of methanol production

Additional emissions during crop plantation:

(ii) diesel consumption during agricultural operations

(iii) pre-combustion emissions from consumed diesel during agricultural operations

(iv) production of crops (utilization of fertilizer)

(v) emergency purchase of crude oils by the bio-diesel plant

The details of how each of these project emissions was calculated separately are described in Section E.

(III) $L_y = L_{Meth,y} + (L_{argo,y} + L_{PD,y} + L_{field,y}) \times Alpha_y + L_{CrudeOil,,y}$

Leakage emission includes emissions from following processes

$L_{Meth,y}$	from production of methanol	(t CO_2)
$L_{argo,y}$	from diesel consumption during agricultural operations	(t CO_2)
$L_{PD,y}$	from production of fossil fuel	(t CO_2)
$L_{field,y}$	from production of crops	(t CO_2)
$Alpha_y$	because of the utilization of fallow land during agricultural operations	(-)
$L_{CrudeOil,,y}$	from purchase of crude oil in emergency cases	(t CO_2)

Emission Reductions:

(IV) $ER_y = BE_y - PE_y - L_y$

Where:

ER_y	emissions reductions of the project activity during the year y	(t CO_{2e})
BE_y	baseline emissions during the year y	(t CO_{2e})
PE_y	project emissions during the year y	(t CO_{2e})
LE_y	leakage emissions in year y	(t CO_{2e})

Additionality Tool:

The following explanation refers to the latest version[6] of the UNFCCC document: "Tools for the demonstration and assessment of additionality" that provides a step-wise approach to demonstrate and assess additionality:

- Step 0: Preliminary screening based on the starting date of the project activity
- Step 1: Identification of alternatives to the project activity consistent with current laws and regulations
- Step 2: Investment analysis or
- Step 3: Barrier analysis
- Step 4: Common practice analysis
- Step 5: Impact of JI registration

[6] Version 2 of 28th November 2005

Step 0: Preliminary screening based on the starting date of the project activity

a) The incentive of JI has been considered since the beginning of the project planning. A prove for seriously considering JI in the decision making process is demonstrated by the following illustration that shows the chronology of the PIN and other relevant documents. The PIN was revised twice by the Bulgarian MOEW in order to clarify some details (mainly related to the technology and standard norms of the produced bio-diesel) and sent again to the Bulgarian Ministry of Environment and Water (MOEW) to apply for the Letter of Support. In the PIN the project owner states its interest to obtain the JI incentive for the proposed project. During May 2006 the Letter of Support was issued by MOEW.

Below the chronology of the Bulgarian JI procedures and relevant documents issued and obtained are shown:

Date	Description of the Document and Action	Number
22.02.06	First version of PIN sent by ABP to MOEW	188-21/02/06
17.03.06	Letter from MOEW to ABP with request for improvement of the PIN	26-00-587
24.03.06	Second version of PIN sent by ABP to MOEW	
04.05.06	Standpoint by MOEW on the second version of PIN	
May 2006	LETTER OF SUPPORT by MOEW	26-00-587

Date	Description of the Document and Action	Number
12.05.06	Notification Letter for Investment intend	A02079
25.05.06	Standpoint by MOEW – Branch Rousse on the Notification Letter	1860

Date	Description of the Document and Action	Number
03.04.06	Letter from ABP to the mayor of SLIVO POLE – Notification for Investment in the area of the municipality	1527-03/04/06
	Announcement in the local newspaper – Notification for Investment in the area of the municipality	

Illustration 14: Chronology of the PIN, Letter of Support and other relevant documents

Republic of Bulgaria

MINISTRY OF ENVIRONMENT AND WATER

To Whom It May Concerns:

LETTER OF SUPPORT

The Ministry of Environment and Water supports in principle the proposed project idea

Proposal number/date	26-00-587/29.03.2006
Title	Bio Diesel Plant
Location	Rousse Region, City of Slivo pole
Supplier	"Astra Bio Plant" Ltd.

and confirms that it falls within the scope of Joint Implementation projects under the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

The Ministry of Environment and Water will consider granting formal approval of the Joint Implementation project according to the Bulgarian procedures and under the following conditions:

- sufficient amount of allowances is available for electricity production and electricity demand reduction projects in the Joint Implementation set aside in the approved by the European Commission National Allocation Plan;
- positive Environmental Impact Assessment Decision;
- submission of a Project Designed Document, validated by an Independent Entity;
- the buyer of the emission reduction generated by the project is a country that has signed a Memorandum/Agreement on cooperation under Article 6 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change with the Republic of Bulgaria;
- the assessment of the project by the Steering Committee established for this purpose, and according to the Bulgarian criteria is positive.

May, 2006
Sofia, Bulgaria
Jordan Dardov
Deputy Minister of Environment and Water

Illustration 15: Letter of Support by MOEW

The translation of the announcement from 1st April 2006 at the newspaper "UTRO" is shown below.

ASTRA BIO PLANT Ltd.
23 BULGARIA STREET,
CITY OF SLIVO POLE

Makes the announcement that it
has investment intent to build
A BIODIESEL PLANT

Illustration 16: Announcement of 1st April 2006 at the local newspaper UTRO

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

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

The project activity has two alternatives that are realistic and credible, as given below:

a) Substituting petroleum diesel with bio-diesel (proposed project activity not undertaken as a JI project activity)
b) Continuation of existing practice of using petroleum diesel (business-as-usual)

There are also two non-realistic alternatives:

c) Substituting petroleum diesel with CNG, LNG or LPG
   Gas as fuel alternative (CNG, LNG or LPG) for diesel driven engines are non-realistic because diesel driven engines work only with diesel or with a diesel alternative like bio-diesel. Therefore benzene (gasoline), electric or hybrid vehicles are also non-realistic scenarios for diesel vehicles. A switch to alternative fuels as mentioned above bonded with high investments for the vehicle owners due to the exchange of engine.
d) Substituting petroleum diesel with crude oil from sunflower and rape
   The development of alternative fuels such as crude oil from sunflower or rape requires creation of additional infrastructure to handle and distribute crude oil fuels for transportation sector. In addition vehicles engines need additional retrofits to use crude oil fuels. All these measurements require huge investments both for the government in creation of infrastructure as well as for the vehicle owners for retrofits. Hence, development of other fuels such as crude oil from sunflower or rape (or mixed) are non-realistic and credible baselines for the project activity.

Sub-step 1b: Enforcement of applicable laws and regulations

The alternatives identified above are in compliance with all applicable legal and regulatory requirements. Moreover, there is no foreseeable regulatory change that would make the above alternatives non-compliant.

Although the EC Directive 2003/30 requires the promotion of bio-fuels by blending it with petroleum diesel, it doesn't include any sanctions for the EU members, if they don't follow the directive.

In addition, the Regulation No 113/17.10.2006 (published on the State Gazette No 88/31.10) was developed. This regulation sets out the conditions and the order for awarding financial grants for the development of environment-friendly agricultural activities under pilot projects under the Special Accession Program of the European Union (EU) for agricultural and rural development in the Republic of Bulgaria. Support will be provided to projects for agro-ecological activities in agricultural entities, which will contribute to the achievement of the objectives of the measure "Development of environment-friendly agricultural activities" from the National plan on agricultural and rural development over the period 2000 – 2006.

Step 2: Investment analysis to determine that the proposed project activity is not the most economically or financially attractive

This step was not applied to show additionality of the project activity as step 3 was deemed more applicable to the type of project.

Step 3: Barrier analysis

Project proponents selected the barrier analysis for the proposed project activity since the project is with its capacity the first of its kind in Bulgaria and is therefore facing several barriers.

Sub-step 3a: Identify barriers that would prevent the implementation of type of the proposed project activity

The following barriers are identified for the proposed project activity:

Administrative and social barriers

The bio-diesel factory, which is the first implemented project of ASTRA BIO PLANT Ltd., is the first

bio-diesel factory with such capacity in Bulgaria. Bio-diesel plants with a capacity with 60,000 tons; such as planned in SLIVO POLE, have not been installed in Bulgaria before. Thus, the affected project participants (authorities, local companies, farmers, neighbors) still lack critical experience with this type of project (environmental impacts, social impacts, technical standards, operational health and safety, etc.).

Barriers due to prevailing practice

The proposed project is with its capacity the first of its kind in Bulgaria and faces some implementation risks. Although the bio-diesel manufacturing is already established in other countries such as the United States of America or European Countries, it has not been successfully implemented in Bulgaria yet.

Due to technological concerns there is no incentive for consumers to change from petroleum diesel to bio-diesel now. One apprehension is that the bio-diesel may affect vehicular performance anticipating poor quality bio-diesel due to the lack of long-term experience. Hence, most vehicle owners prefer to continue using petroleum diesel instead of driving with bio-diesel.

Legal barriers

The European Commission has proposed new legislation to promote the use of alternative fuels for transport, starting with the regulatory and fiscal promotion of bio-fuels like bio-diesel. The regulatory package, which has not been adopted by the member countries but is subject to serious discussions, includes an action plan and two proposals for directives. According to the European Commission, the use of fuels derived from agricultural sources (bio-fuels) is the technology with the greatest potential in the short to medium term. The action plan outlines a strategy to achieve a 20 % substitution of diesel and gasoline fuels by alternative fuels in the road transport sector by 2020.

The taxation directive proposal, which would modify the existing EC Directive 92/81 on excise duties, would allow member states, but not oblige them, to reduce excise duties on pure bio-fuels or bio-fuels blended into other fuels, when they are used for heating or transport purposes. The proposal would allow the countries to reduce excise duties in proportion to the percentage of bio-fuel incorporated in the fuel or end product. No such moves have been initiated in Bulgaria until the end of 2006.7 At the conference "The Market of Bio-fuels in Bulgaria", organized by Dnevnik newspaper (30 October 2006, Sheraton Sofia hotel Balkan) the new draft act for promotion of the development of bio-fuels was discussed. It deals with the elimination of excise duties on bio-fuels, even when they are in a mixed form. So far fuel, which is a mixture of normal diesel and bio-diesel, was liable to excise duty as pure diesel. The new draft

[7] The Sofia Echo, Ivan Vatahov, http://www.sofiaecho.com/article/lower-excise-duties-on-fuels/id_10754/catid_23, status: 2006-09-07

act provides that the excise duty of the mixed fuel will be reduced with such percentage, equal to the percentage of bio-diesel that it contains. The law already passed the first reading by the Bulgarian Parliament.

At the conference mentioned above the Minister of the Economy Rumen Ovcharov announced that "the government has not yet guaranteed for the producers of bio-products the required legal framework so that their projects may become efficient". Mr. Ovcharov thinks that this will be set out in the Renewable Energy Resources Act, which is being developed at present.[8]

Bio-fuels are intended for diesel engines and are environment-friendly. The demand of bio-diesel grows quickly worldwide and the EC Directive 30/2003 encourages in a long-term aspect to sharply increase the share of bio-fuels on the account of petroleum derivatives. In this aspect, bio-diesel will in future occupy basic place among alternative bio-fuels. But up to now due to the barriers mentioned above consumers are scarcely willing to change to bio-diesel and the directive doesn't include any sanctions.

Economic barriers

At present, there exists a severe implementation risk and investment risk due to the fact that no incentives are available to encourage setting up bio-diesel projects, no framework for removal of barriers, no guidelines are available for bio-diesel manufacturing and no economic incentives are proposed for actual bio-diesel consumers in Bulgaria. Hence, the project activity faces several barriers that prevent the project activity from occurring.

Another noteworthy barrier is the preference of users for price competitiveness with petroleum diesel. Consumers prefer bio-diesel only if the price is set below the market price of petroleum diesel irrespective of costs of production. Up to now, in Bulgaria no price for bio-diesel fuel exists yet. This proves to be a significant barrier to the promoters of bio-diesel projects.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

The identified barriers are not affecting the other realistic alternative identified in Step 1, which is continuation of existing practice of using petroleum diesel that is already widespread and viable.

[8] http://www.ebb-eu.org/ and www.mi.government.bg/eng/gzakone/gzakone.html

Step 4: Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity

Bulgaria complies with the requirements of the UNFCCC, ratified by the Bulgarian Parliament in March 1995. Besides, the Parliament of the country ratified the Kyoto protocol to the Convention on 17th July 2002. In Bulgaria, JI projects are viewed as an economically acceptable way of reducing the emissions of anthropogenic greenhouse gases and receiving, at the same time, financial, economic, technical assistance and expertise. In order to start work by the so called "flexible mechanism" under the Kyoto protocol, JI projects have been signed with the Kingdom of Netherlands, the Republic of Austria, the Kingdom of Denmark and the European Bank for Reconstruction and Development (EBRD).

The history of bio-diesel developments in Bulgaria is young.[9] In 2001, the company SAMPO Inc.[10] started the manufacturing of bio-diesel with an annual capacity of 3,000 tons. The effective production volume in 2001 amounted to 26 t, which was sold to fuel distributors and the transport company Trayana Trans. SAMPO used mostly cooking oil supplied by McDonalds, KFC, and Happy etc. The technical standard complies with the Technical Specification TC 0301 (similar to EN 14214). A production plant with an annual capacity of about 500 tons started operation in 2003 and is situated in Gabrovo. The bio-diesel is used as fuel in trucks owned by the company and for heating during the winter. Another plant with an annual capacity of 15,000 tons is currently in process of commissioning. Project proponent is the Green Oil Ltd.[11] in Silistra. The technical standard will comply with EN 14214 and the raw material in use is going to be sunflower, rape and used waste cooking oil. The biggest bio-diesel projects so far planned to be finalized in 2008. The future investment project is developed by Ecopetroleum Industries EAD and will be situated in Vidin with its own port on the Danube River. The planned annual capacity amounts to 150,000 tons, rape seeds will use as raw material.

Due to the differences in capacities of the production plants no other identified project activity is comparable with ASTRA's bio-diesel plant project. After searching the website of UN FCCC[12] it can be noted that no other project has applied for getting support from JI mechanism.

It can be concluded that the manufacturing and the use of bio-diesel in the transportation sector has not been fully established in Bulgaria and experiences with the technology is insufficient. Therefore it is not considered as common practice in this country. There is just little local technology available and there

[9] Ilian Jeliazkov, February 2005, http://www.esdb.bg

[10] http://www.biodiesel.bg

[11] http://greenoil.hit.bg

[12] http://ji.unfccc.int/

are just few experts in the field to apply knowledge in actual projects.

Sub-step 4b: Discuss any similar options that are occurring

Since similar projects are hardly observed in Bulgaria and above all, there are no examples of such projects (with similar capacity) in operation yet, there is no basis for an analysis of similar activities.

Step 5: Impact of JI registration

The proposed project faces a number of barriers. The JI registration would help to surmount these barriers due to the income generated from the Emission Reduction Units (ERUs) sales. The most important element is:

1. JI status of the project activity will alleviate implementation risks and investment risks, because of the additional benefits earned by the emission reduction units. The economy of Bulgaria requires new investments from international sources in the sphere of environmental protection. Transferring the necessary technology and know-how to Bulgaria including the required equipment for bio-diesel production, distribution etc. or the building of local know-how about the technology of bio-diesel production through the involvement of Bulgarian partners in the project will also help to reduce the lack of technical know-how.

Other barriers that can be surmounted by JI registration are:

2. Due to the young history of JI projects in Bulgaria local authorities are inexperienced with JI-procedures (legal framework, handling, competences/responsibility, participants, settlement, monitoring etc.), which means a high risk of delays and maybe even errors in the approval procedures. With the help of this project local authorities will gain more experience, but at the same time the connected financial risks due to delays are covered by the revenues of ERUs.
3. It can be demonstrated how trading in emission reductions via the mechanisms of the Kyoto Protocol could support and assist in making the practice of bio-diesel production economically viable, because the project will reduce greenhouse gas emissions and thereby generate ERUs. Approval and registration of the project as a JI project enables the project promoters to reduce the sale price of the bio-diesel in proportion to the benefits received by selling emission reductions. This reduced price enables the bio-diesel to penetrate into the market and removes the barriers that exist in respect of market conditions and low motivation to switch over to the bio-diesel. The current price for 1 liter petroleum diesel to the end consumer is 1.45 BGN/liter in

Bulgaria. The production costs for 1 liter bio-diesel are currently 1.09 BGN/liter, while the distribution costs for 1 liter bio-diesel are 1.0 to 1.1 BGN/liter.

4. Further, the project will also deliver local community benefits related to the creation of new jobs during construction, operation and maintenance stages of the production plant and the cultivation of the feedstock. Due to these effects the inhabitants will connect such projects with positive feelings and raises the environmental awareness. Besides, the replication of the project activities in other regions, cities and towns around the country will also trigger environmental awareness related to renewable energy resources and climate change in the involved communities and motivate more people to switch over to bio-diesel driven cars.
5. The project will enable the project developer to carry out additional training activities for staff and construction workers with regard to the new technology being employed.

The emission reductions would not occur in the absence of the project activity due mainly to the barriers mentioned above. Based on the previous considerations, the business-as-usual scenario (use of petroleum diesel) is the most likely scenario without claiming emission reductions through the project activity.

B.3. Description of how the definition of the project boundary is applied to the project:

The project boundaries of the proposed project activities are shown in the figure below. Processes that should be included in the project boundary are:

- Transportation of raw material (sunflower and rape seed) from the field to ASTRA BIO PLANT Ltd. with ABP owned trucks
- Production of crude oil
- Production of bio-diesel
- Transportation of bio-diesel (blended or pure) with ABP owned trucks
- Consumption of bio-diesel and blended diesel by vehicles

The rape and sunflower cultivation processes are not included in the project boundary, because the project proponents cannot directly control these processes. However, the emissions from sunflower and rape seed cultivation outside of the project boundary are calculated as leakage. The emissions caused by the fertilizer production (direct and indirect N_2O emissions) are also calculated as leakage.

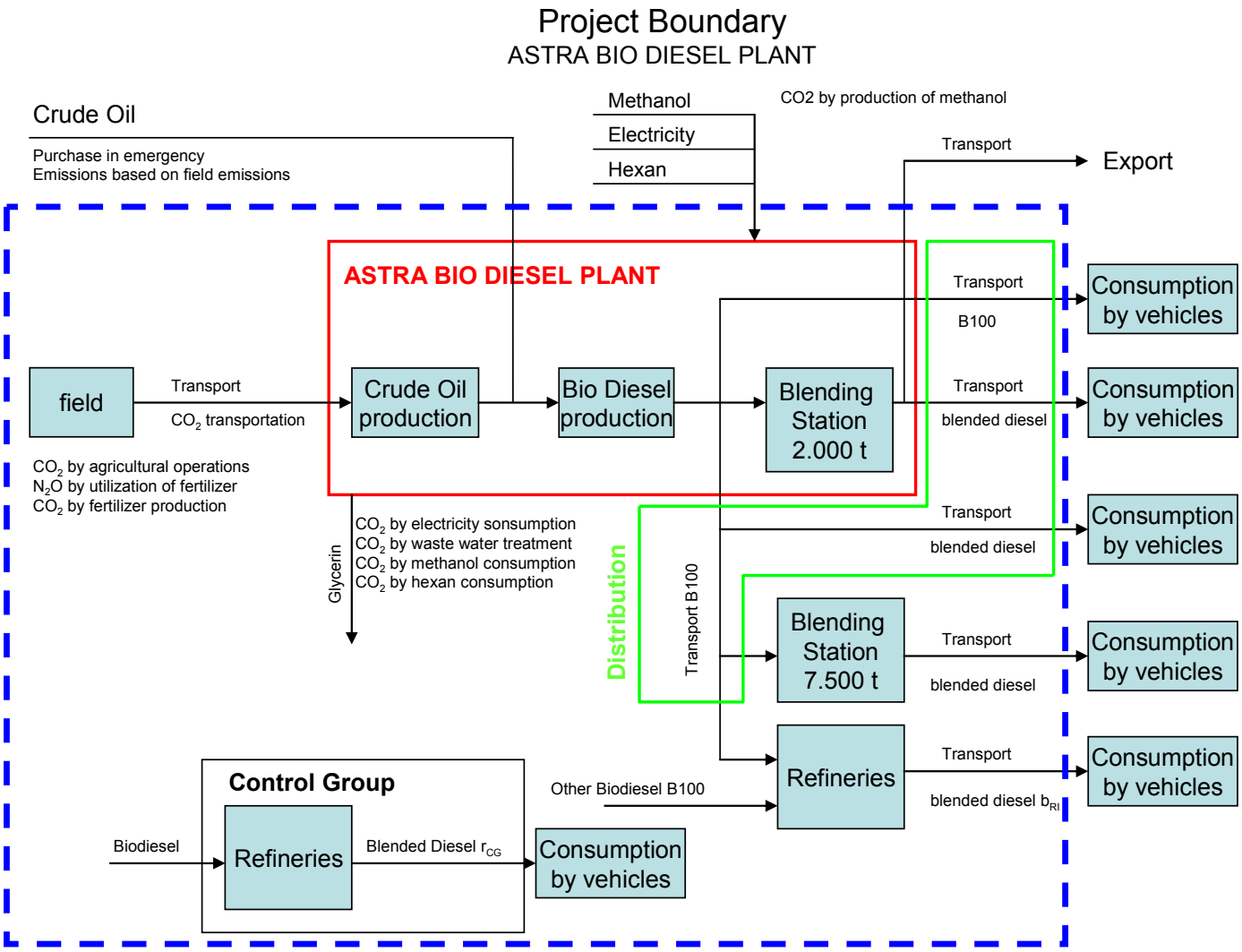


Illustration 17: Project boundaries

	Source	Gas	Included	Monitored	Justification/Explanation
Baseline	Vehicles consuming biodiesel	CO_2	Yes	Yes	Main source of baseline emissions
		CH_4	No	No	Small emission source, and no systematic difference to project activity
		N_2O			
	Mining, transportation of crude oil, refining and transportation of displaced petrodiesel, Well-to-Tank" emissions	CO_2	Yes	Yes	Small emission source
		CH_4	No	No	Small emission source, and no systematic difference to project activity
		N_2O			

	Source	Gas	Included	Monitored	Justification/Explanation
Raw material production	Fossil fuel consumption in agricultural operations	CO_2	Yes	Yes	Outside of the boundary, leakage
		CH_4	No	No	Negligible small
		N_2O			
	Emissions from production of crops	CO_2	Yes	Yes	fertilizer and the production of fertilizer, Outside of the boundary, leakage
		CH_4	Yes	Yes	Negligible small
		N_2O	No	No	
	Fuel combustion during raw material transportation	CO_2	Yes	Yes	"Emission neutral", trucks working with bio diesel
		CH_4	No	No	Negligible small
		N_2O			
Bio diesel fuel production	Electricity consumption in bio diesel production	CO_2	Yes	Yes	Emissionfactor www.moew.government.bg/index_e.html
		CH_4	No	No	Negligible small
		N_2O			
	Hexan consumption for crude oil production	CO_2	Yes	Yes	Measured on the mass of carbon fraction in hexan
		CH_4	No	No	Negligible small
		N_2O			
	Methanol consumption in bio diesel production	CO_2	Yes	Yes	Measured on the mass of carbon fraction in the alcohol
		CH_4	No	No	Negligible small
		N_2O			
	Emissions during methanol production	CO_2	Yes	Yes	Outside of the boundary, leakage
		CH_4	No	No	Negligible small
		N_2O			
	Fuel combustion during fuel transportation	CO_2	Yes	Yes	"Emission neutral", trucks working with bio diesel
		CH_4	No	No	Negligible small
		N_2O			
	Waste water treatment in bio diesel plant	CO_2	No	No	Small emission source
		CH_4	Yes		
		N_2O	No		
Bio diesel consumption	Electricity consumption in refuelling bio diesel or blended bio diesel	CO_2	No	No	Common process in baseline
		CH_4			
		N_2O			
	Pur or blended bio diesel consumption	CO_2	Yes	Yes	CO2 reduction
		CH_4	No	No	Negligible small
		N_2O			

Table 7: Description of the sources and gases in the project:

Explanation how the emissions are taken into account:

Project emissions

(I) $PE_y = PE_{elec,y} + PE_{MeOH,y} + PE_{TfABP} + PE_{TAC} + PE_{ww} + PE_{Hexane} - PE_{Glycerin,y}$

$PE_{Elec,y}$ from electricity consumption in the bio-diesel plant ($t CO_2$)

$PE_{Elec,y} = EC_y \times EF_{CO2e,elec,y} \times 1,1 \times 10^{-3}$

EC_y Grid electricity consumption in bio-diesel plant per year (MWh)

$EF_{CO2e,elec,y}$ CO_2-emission factor of grid electricity consumption by bio-diesel plant (kg CO_2 / MWh)[13]

1,1 10% additional emissions because of the electricity transport losses[14]

The emission factors EFCO2e,elec,y is taken from the official website of the Bulgarian government http://www.moew.government.bg/index_e.html. This value has also to be monitored annually over the Bulgarian government, for the case that the published data will be updated.

At the moment the emission factors for the next years are shown in table below:

Emissionfactor for grid electricity	2007	2008	2009	2010	2011	2012
t CO2/MWh	1,102	1,017	0,894	0,858	0,849	0,838

Table 8: Emission factor for electricity

$PE_{MeOH,y}$ from reaction of fossil carbon contained in methanol ($t CO_2$)

$PE_{MeOH,y} = ME_y \times 12/32 \times 44/12$

ME_y Amount of methanol consumed in bio-diesel plant per year (t)

The calculation is based on the molar weight ratio 12/32 between the carbon content of methanol and methanol (CH_3OH). To get GHG-emissions from the carbon content is the term 44/12 necessary. It is the molar weight ratio from carbon dioxide and carbon.

[13] The emission factors EFCO2e,elec,y were taken from the official website of the Bulgarian government http://www.moew.government.bg/index_e.html.

[14] JI - Bulgarian Energy Efficiency Project Portfolio, Bulgaria, PDD Version 04 – 21 November 2005, Page 3, 4-5

PE_{TfABP} from transport field to Astra Bio Plant ($t CO_2$)

$$PE_{TfABP} = (2 \times D_{fABP} \times EF_{CO2,Truck} \times FE_{Truck} \times (m_{,rape,y} + m_{sunflower,y})) \times 10 / TC_{fABP}$$

D_{fABP} Average round trip distance between field and ABP (km)

$EF_{CO2,truck}$ CO_2-emission factor of the truck fuel (kg CO_2 / l)
= 0 kg CO_2/km if truck operates with bio-diesel or otherwise

Emission factor conversion			Source
Carbon content in petrodiesel	t C /TJ	20,2	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Table 1-2
NCV Petrodiesel	GJ/t	43,33	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Table 1-3
Density Petrodiesel	t/m³	0,845	BDS EEM 14-214
Oxidation	t/t	0,99	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Table 1-4
Emission of Petrodiesel	t CO2/m³	2,68	Calculated
Emission of Petrodiesel	t CO2/t	3,18	Calculated

$FE_{Truck,}$ Average fuel efficiency of truck (litre / 100 km)

$m_{,rape,y}$ Annual mass of purchased crops rape (t)

$m_{sunflower,y}$ Annual mass of purchased crops sunflower (t)

TC_{tABP} Average truck capacity transport crops (t)

Data Astra Bio Diesel owned trucks:
Type: Mercedes-Benz – 1843 LS / 4x2 / 3600 Axor
Serial Number: 94403212
Power: 428 HP
Fuel consumption: Bio-diesel – 35 l / 100 km

PE_{TAC} from transport Astra Bio Plant to consumers ($t CO_2$)

$$PE_{TAC} = (D_{fAC} \times EF_{CO2,Truck} \times FE_{Truck} \times BD_{,y}) \times 10 / TC_{tAC}$$

D_{fAC} Weighted average round trip distance between ABP and consumer (km)

$EF_{CO2,truck}$ CO_2-emission factor of the truck fuel (kg CO_2 / l)
= 0 kg $_{CO2}$ / km if truck operates with bio-diesel

$FE_{Truck,}$ Average fuel efficiency of truck (l / 100 km)

$BD_{,y}$ Amount of bio-diesel sold to customers, filling stations, wholesaler or refineries in Bulgaria per year (t)

TC_{tAC} Average truck capacity transport bio-diesel (t)

PE_{ww} associated with the treatment of waste water ($t CO_2$)

$$PE_{ww} = COD_t \times WW_y \times Bo \times MCF \times GWP_{CH4} \times 10^{-3}$$

WW_y	Waste water production from Astra Bio Plant per year (t)
COD_t	Chemical oxygen demand from oil mill (1,2 kg COD / t WW)[15]
Bo	Maximum methane producing capacity (0,25 kg CH_4 / kg COD)[16]
MCF	Methane conversion factor (1)
	AM0013; MCF = 1 for conservativeness
GWP_{CH4}	Global warming potential of CH_4 (= 21 t CO_2 / t CH_4)

The Rousse Design Company "APX Engineering" Ltd designs the Waste Water Treatment Plant for treatment of the whole water from technological processes of ASTRA BIO PLANT.
The Equipment will be delivered by Company "ELFI TEX" Ltd, City of STARA ZAGORA.
Quality of the treated Water has to meet requirements of "Regulation No 6/09/11/2000" by the MOEW. According this regulation in Chapter five, Art.18 is described all procedures for monitoring of threaded Water.
Capacity: 4 tons/hour
Conservativeness calculation: 300 days per year times 24 hour times 4 tons per hour = 28.800 t WW
The source of this calculation is the IPCC Good Practice Guidance (GPG) method for "Emissions from wastewater handling (section 5.2.1.2 Industrial wastewater of the GPG report).

PE_{Hexane} from the carbon content in the used hexane ($t CO_2$)

$$PE_{Hexane} = HEX_y \times 72/86 \times 44/12$$

HEX_y Amount of hexane consumed in bio-diesel plant per year (t)

The calculation is based on the molar weight ratio between the carbon content of hexane and hexane (C_6H_{12}). To get GHG-emissions from the carbon content is the term 44/12 necessary. It is the molar weight ratio from carbon dioxide and carbon.

$PE_{Glycerin,y} = 0$ reduction because of the substituted Glycerin in other industries (0 $t CO_2$)

[15] IPCC Good Practice Guidance, 5.2.1.2; Table 5.4
[16] IPCC Good Practice Guidance, 5.2.1.2

This amount is zero because of the conservativeness assumption of calculation.

Baseline-scenario emissions:

1. Methodology to estimate the amount of bio-diesel produced by ABP

Basis of the calculation is the total amount of sold bio-diesel by ABP:

BD_{sold} Total amount of sold bio-diesel by ABP (t)

Check 1: Countries separation

$BD_{Bulgarian}$: Bio-diesel sold in Bulgaria by ABP (t)

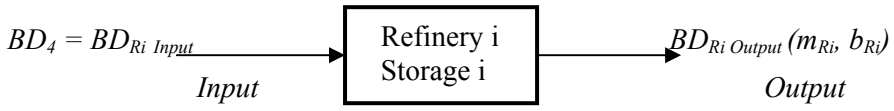
Check 2: Split in distribution channels

(BD_1) $BD_{1-3} = BD_{Bulgarian} - BD_4$

BD_{1-3}: Bio-diesel sold in Channel 1-3 (t)

BD_4: Bio-diesel sold in Channel 4 (t)

Check 3: Utilization of purchased bio-diesel by refineries



$$(BD_2) \quad BD_{Ri} = (BD_4) = \begin{cases} BD_{Ri\ \ Input,t} & BD_{Ri\ \ Input,t} < BD_{Ri\ \ Output,t} \\ BD_{Ri\ \ Output,t} & BD_{Ri\ \ Input,t} > BD_{Ri\ \ Output,t} \end{cases}$$

BD_{Ri} Conservative amount of bio-diesel of refinery i (t)

$BD_{Ri\ Input,t}$ Amount of bio-diesel sold by ABP to refinery i in year t (t)

$BD_{Ri\ Output,t}$ Amount of bio-diesel sold in the form of blended diesel by the refinery i(t)

(BD_3) $BD_{Ri\ Output} = m_{bld} \times b_{Ri} \times NCV_{PD} / NCV_{bdf}$

m_{Ri} Amount of sold blended diesel of refinery i (t)

b_{Ri} Percentage (energetic) of bio-diesel in sold blended diesel, Quality of sold blended diesel of refinery i (t)

Check 4: Checklist for the amount of emission reductions of the refineries due to the "Law to encourage production, distribution and use of bio-fuels"

$$(BD_4) \quad CF_{Ri} = \left\{ \sum_i \left(\frac{b_{Ri} - r_{CG}}{b_{Ri}} \right) \right\}^{1}$$

CF_{Ri}	Correction factor due to uncertainty of law	(-)

Checklist for the amount BD_{Ri}:

- Check 4.1: Legally valid:
  Law passed the parliament and comes into effect: Yes/No
  Source: MP Annex 1 Ministry of Economy and Energy Questionnaire

- Check 4.2: Specified Target:
  Does the law specify any targets concerning the blending of bio-diesel with petroleum diesel? Yes/No
  Source: Annex 1 Ministry of Economy and Energy Questionnaire

- Check 4.3: Incentives or penalties:
  Is there a penalty or an incentive for the refineries to reach these targets, which in case of non-compliance with the target results in a severe economic loss or benefit for the refinery compared to compliance (e.g. zero excise tax)? Yes/No
  Source: Annex 2: Approval delivered by refineries

- Check 4.4: Control Groups:
  Is the level of blended bio-diesel with petroleum diesel in a comparable control group of refineries in Bulgaria considerable to the level of the ABP delivered refineries? Yes/No
  Source: Annex 4: Information by control group

(BD_5) $b_{Ri} \sim r_{CG}$

r_{CG}	Blended bio-diesel in petroleum diesel in control group	(%)

Summary of the determination of the amount of bio-diesel fuel:

$$(BD_5) \quad BD_y = BD_{1\text{-}3} + \sum_i BD_{Ri} * CF_{Ri}$$

BD_y	**Amount of bio-diesel for calculation of baseline emissions**	**(t)**
$BD_{1\text{-}3r}$	Amount of sold bio-diesel in distribution channel 1-3	(t)

CF_{Ri} Correction factor because of check 4 (-)

$\sum_i BD_{Ri}$ Conservative amount of bio-diesel delivered to refineries (t)

2. Calculation of baseline emissions

(II) $BE_y = BE_{BL\_PC,y} + BE_{v,y}$

Pre-combustion emissions from production of fossil fuels in the baseline scenario

$$BE_{BL\_PC,y} = BD_y \times NCV_{bdf} / NCV_{PD} \times EF_{BL\_PC,y}$$

BD_y Amount of bio-diesel sold to customers, filling stations, wholesaler or refineries in Bulgaria per year (t)

NCV_{bdf} Net calorific value of bio-diesel (MJ / kg)[17]

NCV_{PD} Net calorific value of petroleum diesel (43,33 MJ / kg)[18]

$EF_{BL\_PC,y}$ Emission factor for pre-combustion from production of fossil fuels (0,5 t CO_2 / t)

Leakage associated with production of fossil fuels is calculated based on the amount of displaced fossil fuels and an emission factor for the pre-combustion emissions. The default value for the emission factor $EF_{BL\_PC,y}$ is 0,5 t CO_2 / t of petroleum diesel fuel. This is a conservative value applicable to all types of fossil fuels, in particular: petroleum diesel, gasoline and kerosene. It covers emissions of CO_2 and CH_4 during all steps in the production chain of the fossil fuels until they reach the regional fuel distribution center, such as exploration, production, refining and the different transport steps. The default value for $EF_{BL\_PC,y}$ is based on European data for petroleum diesel.

Emissions from petroleum diesel consumption by vehicles

$$BE_{v,y} = BD_y \times NCV_{bdf} \times EF_{C,petrod} \times OXID_{petrod} \times 44/12 \times 10^{-3}$$

BD_y Amount of bio-diesel sold to customers, filling stations, wholesaler or refineries in Bulgaria per year (t)

NCV_{bdf} Net calorific value of bio-diesel (MJ / kg)[19]

[17] Laboratory analysis by SGS BULGARIA Ltd.

[18] Revised 1996 IPCC; Guidelines for national Greenhouse Gas; Table 1-3

[19] Laboratory analysis by SGS BULGARIA Ltd.

$EF_{C,petrod}$ Carbon content of petroleum diesel (20,2 t C / TJ)[20]

$OXID_{petrod}$ Oxidation factor of petroleum diesel (0,99)[21]

Leakage emissions:

(III) $L_y = L_{Meth,y} + (L_{argo,y} + L_{PD,y} + L_{field,y}) \times Alpha_y + L_{CrudeOil,,y}$

Leakage emission includes emissions from following emissions

$L_{Meth,y}$ from production of methanol ($t CO_2$)

$L_{Meth,y} =: ME_y * EF_{Meth,pc}$

ME_y Amount of methanol consumed in bio-diesel plant per year (t)

$EF_{Meth,pc}$ Pre-reaction emission factor for methanol production (2,0 t CO_2 / t)[22]

$L_{argo,y}$ from consumed fossil diesel during agricultural operation ($t CO_2$)

$L_{argo,y} = (ADC_{rape} \times m_{rape,y} / Y_{rape,y} + ADC_{sunflower} \times m_{sunflower,y} / Y_{sunflower,y}) \times density_{PD} \times$
$\times EF_{CO2,petrod} \times 10^3$

ADC_{rape} Annual average diesel consumption per hectare rape (l / ha)

$ADC_{sunflower}$ Annual average diesel consumption per hectare sunflower (l / ha)

$Y_{rape,y}$ Annual average yield rape (t / ha)

$Y_{sunflower,y}$ Annual average yield sunflower (t / ha)

$m_{rape,y}$ Annual mass of purchased crops rape (t)

$m_{sunflower,y}$ Annual mass of purchased crops sunflower (t)

$density_{PD}$ density petroleum diesel (0,845 kg / l)[23]

$EF_{CO2,petrod}$ Emission factor for petroleum diesel (3,18 t CO_2 / t)

[20] Revised 1996 IPCC; Guidelines for national Greenhouse Gas; Table 1-2

[21] Revised 1996 IPCC; Guidelines for national Greenhouse Gas; Table 1-4

[22] http://edj.net/sinor/SFR4-99art7.html; Specific primary energy consumption in methanol plants is assumed as 30 GJ / t MeOH (Source: http://edj.net/sinor/SFR4-99art7.html). CO_2-emission factor is assumed as 65 kg CO_2 / MJ (average of IPCC emission factors for natural gas and diesel).

[23] EN 590:2004

Emission factor conversion			Source
Carbon content in petrodiesel	t C /TJ	20,2	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Table 1-2
NCV Petrodiesel	GJ/t	43,33	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Table 1-3
Density Petrodiesel	t/m³	0,845	BDS EEM 14-214
Oxidation	t/t	0,99	Revised 1996 IPCC; Guidelines for national Greenhous Gas; Table 1-4
Emission of Petrodiesel	t CO2/m³	2,68	Calculated
Emission of Petrodiesel	t CO2/t	3,18	Calculated

$L_{PD,y}$ from pre-emissions of diesel production for agricultural operation (t CO_2)

Leakage GHG-emission from mining and transporting of crude oil, refining and transportation of consumed petroleum during agricultural operation (t CO_2).

$$L_{PD,y} =: (ADC_{rape} \times m_{rape,y} / Y_{rape,y} + ADC_{sunflower} \times m_{sunflower,y} / Y_{sunflower,y}) \times density_{PD} \times \times EF_{BL\_PC,y} \times 10^{-3}$$

ADC_{rape} Annual average diesel consumption per hectare rape (l / ha)

$ADC_{sunflower}$ Annual average diesel consumption per hectare sunflower (l / ha)

$Y_{rape,y}$ Annual average yield rape (t / ha)

$Y_{sunflower,y}$ Annual average yield sunflower (t / ha)

$m_{rape,y}$ Annual mass of purchased crops rape (t)

$m_{sunflower,y}$ Annual mass of purchased crops sunflower (t)

$density_{PD}$ density petroleum diesel (0,845 kg / l)[24]

$EF_{BL\_PC,y}$ Emission factor for pre-combustion from production of fossil fuels (t CO_2 / t)

$L_{field,y}$ from production of crops (t CO_2)

$$L_{field,y} = \sum_i \left(\frac{Mcrop_{i,y}}{Y_{i,y}} \right) * EF_{N,i,y}$$

$Y_{i,y}$ Annual average yield feedstock per ha and crop i (t / ha)

$Mcrop_{i,y}$ Annual purchased mass of crop i (t)

$= m_{rape,y}$, $m_{sunflower,y}$

$EF_{N,I,y}$ Emission factor for enhanced N for crop i (t CO_2 / ha)

Emissions from agricultural operations are calculated based on the measured annual purchase of mass of crop i, average yield from crop i, annual average diesel consumption, as shown in equation above. The emission factor $EF_{N,i,y}$ is composed of three components, as shown in equation below.

[24] EN 590:2004

$$EF_{N,i,y} = EF_{FN,i,y} + EF_{FP,i,y} + EF_{RN,i,y}$$

$EF_{FN,I,y}$ Emission factor N_2O emissions from fertilizer N applied to soil (t CO_2 / ha)

$EF_{FP,I,y}$ Emission factor for GHG-emissions associated with N-fertilizer production (t CO_2 / ha)

$EF_{RN,i,y}$ Emission factor for N_2O emissions from crop residue N returned to soil (t CO_2 / ha)

$$EF_{FN,I,y} = m_{SN,I,y} \times EF_1 \times 44/12 \times GWP_{N2O}$$

The N_2O-emission factor for fertilizer N, $EF_{FN,i,y}$ is calculated based on the amounts of organic and synthetic fertilizer applied to oil crop i, and a default emission factor EF 1, in accordance with equation above.

$$EF_{FP,I,y} = (m_{SN,I,y} - m_{RNEXI,y}) \times EF_2$$

The emission factor for production of synthetic fertilizer, $EF_{FP,i,y}$ is calculated based on monitoring consumption of both synthetic and organic fertilizer for crop i, and adjusted for residue N exported as fertilizer to other farmers $m_{RNEXI,y}$, in accordance with equation above. Residue N exported to other farmers (especially de-oiled seed cake) is deducted because these residues will likely displace synthetic fertilizer elsewhere, based on the same logic.

$$EF_{RN,i,y} = (m_{RN,I,y} - m_{RNEXI,y}) \times EF_1 \times 44/12 \times GWP_{N2O}$$

The N_2O-emission factor for residue N returned to soils, $EF_{RN,i,y}$ is calculated from the total amount of residue N from crop I that is returned to (any) soil $m_{RN,I,y}$, minus the amount of residue N exported as fertilizer to other farmers $m_{RNEXI,y}$. The deduction for exported N is again based on the assumption that these exports will displace other fertilizer, which would result in the same N_2O-emissions in the baseline scenario. The total amount of residue N $m_{RN,I,y}$ is defined by the mass of the residues returned to soils and their respective N-contents. It includes de-oiled cake as well as any other residues of relevant volume and N content which are returned to soils, such as e.g. shells, butt not the leaves shed by deciduous trees.

$m_{SN,I,y}$- Synthetic fertilizer-N applied to crop i in year y (kg N / ha)

$m_{RNEXI,y}$ Residue-N from crop i exported as fertilizer (= not returned to crop plantation i) (kg N / ha)

$m_{RN,I,y}$ Amount of residue-N from crop i that is returned to any soil (kg N / ha)

EF_1 Fraction of fertilizer N converted to N_2O-N (0,0125 kg / kg)[25]

EF_2 Upstream emission from production of synthetic fertilizer (2,2 kg CO_2 / kg N)[26]

GWP_{N2O} Global warming potential of N_2O (= 310 t CO_2 / t N_2O)

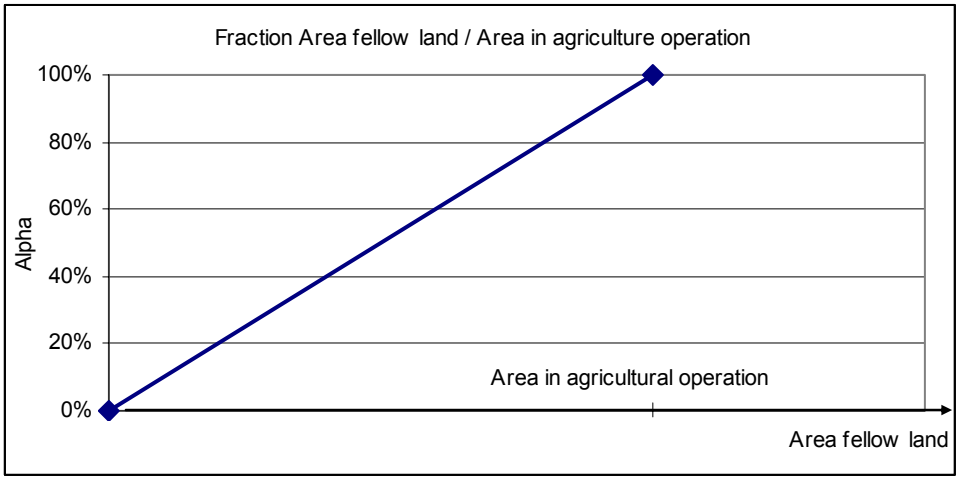
$Alpha_y$ because of the utilization of fallow land during agricultural operations (-)

$$Alpha = Area_{FL} / Area_{AP}$$

$Area_{FL}$ Area of fallow land in Bulgaria (ha)

$Area_{AP}$ Area with agricultural purpose in Bulgaria (ha)

The value Alpha shows the fraction of used fallow land by ASTRA BIO PLANT. The demanded rape and sunflower crops have an influence on the demand of agricultural used area in Bulgaria. The additional production of rape and sunflowers replaces on the one hand the crop production on the existing agricultural land and on the other hand, if fallow land will be used, the fraction between fallow and already cultivated land. If the crops grow up on already existing fields the emissions from transportation, diesel consumption during the agricultural cultivation (leakage) and from the already used fertilizer (leakage) are not additionally, because the emissions are now in the baseline. If fallow land will be used for the cultivation of rape and sunflowers the emissions are additional. Because the allocation of additionally used fallow land by the ASTRA BIO PLANT is difficult and too many factors influence this value, in case of conservativeness, the fraction between fallow land and land with agricultural purpose ascribe to the project demand.[27]



[25] IPCC 1996 Revised Guidelines for Natural GHG Inventory, Reference Manual p. 4.89

[26] Average emission factor for production of N fertilizer, assuming primary energy demand of 38,9 MJ / kg N and natural gas as the primary energy source (http://www.fao.org/wairdocs/lead/x6113e/x6113e09.htm).

[27] http://www.mzgar.government.bg; The values are released by the Bulgarian ministry of agriculture and forestry in Annual Reports.

Illustration 18: Alpha; Fraction area fallow land / area in agriculture operation

The illustration above gives a better understanding for the value alpha. In case that the entire agricultural area in Bulgaria is used, the value for alpha is zero. The additional demand on farmland, which is needed to produce oil crops, will be satisfied by existing agricultural used areas. The emissions from the fields are not additional, because of the emissions for the production of other crops. If all of the land is fallow land, then the emissions during the production of oil crops are 100 % additional.

$L_{CrudeOil,,y}$ from purchase of crude oil in emergency cases (t CO_2)

$$L_{CrudeOil,,y} = (L_{argo,y} + L_{PD,y} + L_{field,y}) / (m_{rape,y} + m_{sunflower,y}) \times m_{CrudeOil,y} \times alpha / CF_{CrudeOil/Crops}$$

$m_{rape,y}$ Annual mass of purchased crops rape (t)

$m_{sunflower,y}$ Annual mass of purchased crops sunflower (t)

$m_{CrudeOil,y}$ Annual mass of purchased crude oil in emergency cases (t)

$CF_{CrudeOil/Crops}$ Conversion factor for received mass of crude oil per mass crops [0,3]

As shown on page 1-, the production of 400 kg crude oil needs 1.000 kg crops (sunflowers). The mass of crude oil is 40 % of the mass of purchased sunflowers. The exploitation of the pre-treatment depends on the bonded oil content in the crop. Rape has lower oil content as sunflowers. For a conservative calculation of emission reduction units a value of 30 % will be used.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Completion date of the baseline study: 29 May 2007

The baseline is determined by: KWI Consultants GmbH
Fuhrmannsgasse 3-7
A-3100 St. Pölten
Austria
www.kwi.at

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

November 2006

C.2. Expected operational lifetime of the project:

20 years

C.3. Length of the crediting period:

Crediting Period: 5 years:
01.01.2008 – 31.12.2012
Generation of Emission Reduction Units (ERU)

AAU – Period:
01.06.2007 – 31.12.2007
It is planned that the emissions reduction that originate from before 2008 will be effectively handled as Assigned Amount Units (AAU), which will be transferred by International Emission Trading after 2008. Afterwards the first period starts.

Emission Reduction Period at all:
01.06.2007 – 31.12.2012

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	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
111.1	*Grid electricity consumption in bio-diesel plant per year (EC_y)*	*Astra Bio Plant, Plant record (Sale recording data)*	*MWh*	*m*	*monthly*	*100 %*	*Electronic*	
111.2	*CO_2-emission factor of grid electricity consumption by bio-diesel plant ($EF_{CO2e,elec,y}$)*	*Grid supplier data or from the Bulgarian government http://www.moew.government.bg/index_e.html*	*kg CO_2 / MWh*	*e*	*annually*	*100 %*	*Electronic*	
111.3	*Amount of methanol consumed in bio-diesel plant per year (ME_y)*	*Astra Bio Plant, Plant record (Sale recording data)*	*t*	*m*	*monthly y*	*100 %*	*Electronic*	
111.4	*Average round trip*	*Astra Bio Plant,*	*km*	*m*	*annually*	*100 %*	*Electronic*	

	distance between field and ABP (D_{fABP})	*Conservative value = 800 km (max. of Bulgaria)*						
111.5	*CO_2-emission factor of the truck fuel ($EF_{CO2,truck}$)*	*IPCC Guidelines for national Greenhouse Gas Sources: Table 1-2, 1-3, 1-4 and Density Petrodiesel BDS EEM 14-214; Or 0 if biodiesel operated.*	*kg CO_2 / l*	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Guideline*
111.6	*Fuel efficiency of truck (FE_{Truck})*	*Astra Bio Plant, manufactor data*	*liter / 100 km*	*m*	*monthly*	*100 %*	*Electronic*	
111.7	*Annual mass of purchased rape crops ($m_{rape,y}$)*	*Astra Bio Plant, Plant record (purchase data)*	*t*	*c*	*annually*	*100 %*	*Electronic*	
111.8	*Annual mass of purchased sunflower crops ($m_{sunflower,y}$)*	*Astra Bio Plant, Plant record (purchase data)*	*t*	*c*	*annually*	*100 %*	*Electronic*	
111.9	*Average truck capacity (TC_{fABP})*	*Astra Bio Plant, Plant record*	*t*	*m*	*annually*	*100 %*	*Electronic*	
111.10	*Weighted average distance to consumer (D_{fAC})*	*Astra Bio Plant, Plant record (purchase data)*	*km*	*m*	*annually*	*100 %*	*Electronic*	
111.11	*Amount of bio-diesel fuel sold to costumer per year (BD_y)*	*Astra Bio Plant, Plant record (purchase data)*	*t*	*c*	*annually*	*100 %*	*Electronic*	
111.12	*Average truck capacity (TC_{tAC})*	*Astra Bio Plant, Plant record*	*t*	*m*	*annually*	*100 %*	*Electronic*	
111,13	*Waste Water production from Astra Bio Plant per year (WWy)*	The Equipment will be delivered by Company "ELFI TEX" Ltd, City of STARA ZAGORA. Quality of the treated Water has to meet requirements of	*t*	*e*	*annually*	*100 %*	*Electronic*	

		"Regulation No 6/09/11/2000" by the MOEW. According this regulation in Chapter five, Art.18 is described all procedures for monitoring of threaded Water. Capacity: 4 tons/hour						
111.14	*Chemical oxygen demand from oil mill (CODt)*	*Good Practice Guidance and Uncertainty Management, Section 5.2.1.2, table 5.4: Vegetable Oils Range: 0.5 – 1,2 g/l*	*kg COD / t WW*	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Good Practice Guidance and Uncertainty Management*
111.15	*Maximum methane producing capacity (Bo)*	*Good Practice Guidance and Uncertainty Management, Section 5.2.1.2, page 5.20; paragraph 1,*	*kg CH_4 / kg COD*	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Good Practice Guidance and Uncertainty Management*
111.16	*Methane conversion factor (MCF)*	*Approved methodology AM0013 or MCF = 1 for conservativeness*	*-*	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Guideline*
111.17	*Global worming potential CH_4 (GPW_{CH4})*	*IPCC Guidelines for national Greenhouse Gas*	*t CH_4 / t N_2O*	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version*

								IPCC Guideline
111.18	*Annual combustion of hexane (HEXy)*	*Astra Bio Plant, Plant record*	*t*	*e*	*monthly*	*100 %*	*Electronic*	

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

(1) $PE_y = PE_{elec,y} + PE_{MeOH,y} + PE_{TfABP} + PE_{TAC} + PE_{ww} + PE_{Hexan} - PE_{Glycerin,y}$

$PE_{Elec,y}$ from electricity consumption in the bio-diesel plant ($t CO_2$)

(2) $PE_{Elec,y} = EC_y \times EF_{CO2e,elec,y} \times 1,1 \times 10^{-3}$

EC_y Grid electricity consumption in bio-diesel plant per year (MWh)

$EF_{CO2e,elec,y}$ CO_2-emission factor of grid electricity consumption by bio-diesel plant (kg CO_2 / MWh)

1,1 10% additional emissions because of the electricity transport losses (t / t)

(3) $PE_{MeOH,y} = ME_y \times 12/32 \times 44/12$

ME_y Amount of methanol consumed in bio-diesel plant per year (t)

(4) $PE_{TfABP} = (2 \times D_{fABP} \times EF_{CO2,Truck} \times FE_{Truck} \times (m_{,rape,y} + m_{sunflower,y})) \times 10 / TC_{fABP}$

D_{fABP}	Average round trip distance between field and ABP (km)
$EF_{CO2,truck}$	CO_2-emission factor of the truck fuel (kg CO_2 / l)
$FE_{Truck,}$	Average fuel efficiency of truck (liter / 100 km)
$m_{,rape,y}$	Annual mass of purchased crops rape (t)
$m_{sunflower,y}$	Annual mass of purchased crops sunflower (t)
TC_{tABP}	Average truck capacity transport crops (t)

(5) $PE_{TAC} = (D_{fAC} \times EF_{CO2,Truck} \times FE_{Truck} \times BD_{,y}) \times 10 / TC_{tAC}$

D_{fAC}	Weighted average round trip distance between ABP and consumer (km)
$EF_{CO2,truck}$	CO_2-emission factor of the truck fuel (kg CO_2 / l) = 0 kg CO_2 / km if truck operates with bio-diesel
$FE_{Truck,}$	Average fuel efficiency of truck (liter / 100 km)
$BD_{,y}$	Amount of bio-diesel sold to customers, filling stations, wholesaler or refineries in region per year (t)
TC_{tAC}	Average truck capacity transport bio-diesel (t)

(6) $PE_{ww} = COD_t \times WW_y \times Bo \times MCF \times GWP_{CH4} \times 10^{-3}$

WW_y	Waste water production from Astra Bio Plant per year (t)
COD_t	Chemical oxygen demand from oil mill (1,2 kg COD / t WW)[28]
Bo	Maximum methane producing capacity (0,25 kg CH_4 / kg COD)[29]

[28] IPCC Good Practice Guidance, 5.2.1.2; Table 5.4

MCF Methane conversion factor (1)
AM0013; MCF = 1 for conservativeness

GWP_{CH4} Global warming potential of CH_4 (= 21 t CO_2 / t CH_4)

(7) $PE_{Hexan} = HEX_y \times 72/86 \times 44/12$

HEX_y Amount of hexane consumed in bio-diesel plant per year (t)

(8) $PE_{Glycerin,y} = 0$

This amount is zero because of the conservativeness assumption of calculation.

[29] IPCC Good Practice Guidance, 5.2.1.2

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	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
113.1	*Net calorific value of bio-diesel (NCV_{bdf})*	*Laboratory analysis by SGS BULGARIA LTD*	*MJ / kg*	*m*	*monthly*	*100 %*	*Electronic*	*SGS BULGARIA LTD. Office – Varna, 14, Knyaz Batenberg Street, 9000 Varna, Bulgaria*
113.2	*Carbon content of petroleum diesel ($EF_{C,petrod}$)*	*IPCC Guidelines for national Greenhouse Gas*	*t C / TJ*	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Guideline*
113.3	*Oxidation factor of petroleum diesel ($OXID_{petrod}$)*	*IPCC Guidelines for national Greenhouse Gas*		*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Guideline*
113.4	*Emission factor for pre-combustion from production of fossil fuels ($EF_{BL\ PC,y}$)*	*Swiss EcoInventory of Energy Systems, 2nd Edition, Vol. 1, 1995, p.245*	*t CO_2 / t petroleum diesel*	*e*	*annually*	*100 %*	*Electronic*	
113.5	*Net calorific value of petroleum diesel (NCV_{PD})*	*IPCC Guidelines for national Greenhouse Gas*	*MJ / kg*	*m*	*Annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Guideline*
113.6	*Total amount of sold bio-diesel by ABP (BD_{sold})*	*Astra Bio Plant, Plant record (Sale recording data)*	*t*	*e*	*monthly*	*100 %*	*Electronic*	

113.7	*Bio-diesel sold in Bulgaria by ABP ($BD_{Bulgarian}$)*	*Astra Bio Plant, Plant record (Sale recording data)*	*t*	*e*	*monthly*	*100 %*	*Electronic*	
113.8	*Bio-diesel sold in Channel 1-3 (BD_{1-3})*	*Astra Bio Plant, Plant record (Sale recording data)*	*t*	*e*	*monthly*	*100 %*	*Electronic*	
113.9	*Bio diesel sold in Channel 4 (BD_4)*	*MP, Annex 2: Approval delivered by refineries*	*t*	*e*	*monthly*	*100 %*	*Electronic*	
113.10	*Amount of bio-diesel sold by ABP to refinery i in year t ($BD_{Ri\_Input,t}$)*	*MP, Annex 2: Approval delivered by refineries*	*t*	*e*	*monthly*	*100 %*	*Electronic*	
113.11	*Amount of bio-diesel sold in the form of blended diesel by the refinery i per year ($BD_{Ri\_Output,t}$)*	*MP, Annex 2: Approval delivered by refineries*	*t*	*e*	*Annually*	*100 %*	*Electronic*	
113.12	*Amount of sold blended diesel of refinery i (m_{Ri})*	*MP, Annex 2: Approval delivered by refineries*	*t*	*e*	*Annually*	*100 %*	*Electronic*	
113.13	*Percentage (energetic) of bio-diesel in sold blended diesel, Quality of sold blended diesel of refinery i (b_{Ri})*	*MP, Annex 2: Approval delivered by refineries*	*t*	*c*	*Annually*	*100 %*	*Electronic*	

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

1. Methodology to estimate the amount of bio-diesel produced by ABP

Basis of the calculation is the total amount of sold bio-diesel by ABP:

BD_{sold} Total amount of sold bio-diesel by ABP (t)

Check 1: Countries separation

$BD_{Bulgarian}$: Bio-diesel sold in Bulgaria by ABP (t)

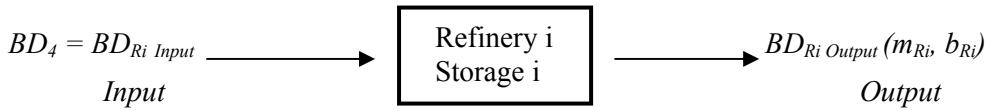
Check 2: Split in distribution channels

(BD_1) $BD_{1-3} = BD_{Bulgarian} - BD_4$

BD_{1-3}: Bio-diesel sold in Channel 1-3 (t)

BD_4: Bio diesel sold in Channel 4 (t)

Check 3: Utilization of purchased bio-diesel by refineries



$$(BD_2) \quad \mathrm{BD_{Ri}} = (\mathrm{BD_4}) = \begin{cases} BD_{Ri\ \ Input,t} & BD_{Ri\ \ Input,t} < BD_{Ri\ \ Output,t} \\ BD_{Ri\ \ Output,t} & BD_{Ri\ \ Input,t} > BD_{Ri\ \ Output,t} \end{cases}$$

BD_{Ri}	Conservative amount of bio-diesel of refinery i	(t)
$BD_{Ri\ Input,t}$	Amount of bio-diesel sold by ABP to refinery i in year t	(t)
$BD_{Ri\ Output,t}$	Amount of bio-diesel sold in the form of blended diesel by the refinery i	(t)

(BD_3) $BD_{Ri\ Output} = m_{bld} \times b_{Ri} \times NCV_{PD} / NCV_{bdf}$

m_{Ri}	Amount of sold blended diesel of refinery i	(t)
b_{Ri}	Percentage (energetic) of bio-diesel in sold blended diesel, Quality of sold blended diesel of refinery i	(t)

Check 4: Checklist for the amount of emission reductions of the refineries due to the "Law to encourage production, distribution and use of bio-fuels"

$$(BD_4) \quad \mathrm{CF_{Ri}} = \left\{ \sum_i \left(\frac{b_{Ri} - r_{CG}}{b_{Ri}} \right) \right\}^{1}$$

CF_{Ri}	Correction factor due to uncertainty of law	(-)

As long as any of the questions of check 4 are answered with "NO", the operation of Astra Bio Diesel JI-Project and all its deliveries of bio-diesel to refineries are additional. Only in case that all answers are "YES" the amount of bio-diesel, which has been blended in the refineries supplied by ABP above the average

blending of bio diesel from non JI- bio diesel producers in the refineries of the control group, contributes to emission reductions compared to the baseline.

Checklist for the amount BD_{Ri}:

- Check 4.1: Legally valid:
  Law passed the parliament and comes into effect: Yes/No

- Check 4.2: Specified Target:
  Does the law specify any targets concerning the blending of bio-diesel with petroleum diesel? Yes/No

- Check 4.3: Incentives or penalties:
  Is there a penalty or an incentive for the refineries to reach these targets, which in case of non-compliance with the target results in an severe economic loss or benefit for the refinery compared to compliance? Yes/No

- Check 4.4: Control Groups:
  Is the level of blended bio-diesel with petroleum diesel in a comparable control group of refineries in Bulgaria equal to the level of the ABP delivered refineries? Yes/No
  (BD_5) $b_{Ri} \sim r_{CG}$

r_{CG} Blended bio-diesel in petroleum diesel in control group (%)

Summary of the determination of the amount of bio diesel fuel:

(BD_5) $BD_y = BD_{1-3} + \sum_i BD_{Ri} * CF_{Ri}$

BD_v	**Amount of bio-diesel for calculation of baseline emissions**	**(t)**
BD_{1-3r}	Amount of sold bio-diesel in distribution channel 1-3	(t)
CF_{Ri}	Correction factor because of check 4	(-)
$\sum_i BD_{Ri}$	Conservative amount of bio-diesel delivered to refineries	(t)

2. Calculation of baseline emissions

(9) $BE_y = BE_{BL\_PC,y} + BE_{v,y}$

(10) $BE_{BL\_PC,y} = BD_y \times NCV_{bdf} / NCV_{PD} \times EF_{BL\_PC,y}$

BD_y	Amount of bio-diesel sold to customers, filling stations, wholesaler or refineries in region per year (t)
NCV_{bdf}	Net calorific value of bio-diesel (MJ / kg)
NCV_{PD}	Net calorific value of petroleum diesel (43,33 MJ / kg)
$EF_{BL\_PC,y}$	Emission factor for pre-combustion from production of fossil fuels (0,5 t CO_2 / t)

(11) $BE_{v,y} = BD_y \times NCV_{bdf} \times EF_{C,petrod} \times OXID_{petrod} \times 44/12 \times 10^{-3}$

BD_y	Amount of bio-diesel sold to customers, filling stations, wholesaler or refineries in region per year (t)

NCV_{bdf} Net calorific value of bio-diesel (MJ / kg)

$EF_{C,petrod}$ Carbon content of petroleum diesel (20,2 t C / TJ)

$OXID_{petrod}$ Oxidation factor of petroleum diesel (0,99)

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived (electronic / paper)?	Comment

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions / emission reductions in units of CO_2 equivalent):

D.1.3. Treatment of leakage in the monitoring plan:

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	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
131.1	*Pre-reaction emission factor for methanol production*	*Specific primary energy consumption in methanol plants is assumed as 30 GJ / t MeOH (Source: http://edj.net/sinor/SFR4-99art7.html; modern plants*	2,0 t CO_2 / t	*e*	*Annually*	*100 %*	*Electronic*	

	($EF_{Meth,pc}$)	*rech 29 MJ / t MeOH). CO_2-emission factor is assumed as 65kg CO_2 / MJ (average od IPCC emission factors for natural gas and diesel oil)*						
131.2	*Annual average yield of rape per ha ($Y_{rape,y}$)*	*Ministry of Agriculture and Forestry; Republic of Bulgaria;http://www.mzgar.government.bg/MZ_eng/OfficialDocuments/Agry_report/Agry_report.htm; Annual reports / Annex 1*	t / ha	*e*	*annually*	*100 %*	*Electronic*	
131.3	*Annual average yield of rape per ha ($Y_{sunflower}y$)*	*Ministry of Agriculture and Forestry; Republic of Bulgaria;http://www.mzgar.government.bg/MZ_eng/OfficialDocuments/Agry_report/Agry_report.htm; Annual reports / Annex 1*	t / ha	*e*	*annually*	*100 %*	*Electronic*	
131.4	*Synthetic fertilizer-N applied to crop i in year y ($m_{SN,I,y}$)*	*as national or local government or local farmer association*	kg N /ha	*e*	*annually*	*100 %*	*Electronic*	
131.5	*Residue-N from crop i exported as fertilizer ($m_{RNEXI,y}$)*	*Plant data or national or local government or local farmer association*	kg N / ha	*e*	*annually*	*100 %*	*Electronic*	
131.6	*Amount of residue-N from crop i that is returned to any soil ($m_{RN,I,y}$)*	*Plant data or national or local government or local farmer association*	kg N / ha	*e*	*annually*	*100 %*	*Electronic*	
131.7	*Fraction of fertilizer N converted to N_2-O-N (EF_1)*	*IPCC 1996 Revised Guidelines for National GHG-Investors, reference Manual, p. 4.89*	0,0125 N_2-O-N kg / N kg	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Guideline*
131.8	*Upstream emission from production of synthetic fertilizer (EF_2)*	*Average emission factor for production of N fertilizer, assuming primary energy demand of 38,9 MJ / kg N and natural gas as the primary energy source.http://www.fao.org/wairdocs/lead/x6113e/x6113e09.htm*	2,2 kg CO_2 / kg N	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Guideline*

131.9	*Global warming potential of N2O (GWP_{N2O})*	*IPCC Guidelines for national Greenhouse Gas*	310 t CO_2 / t N_2O	*e*	*annually*	*100 %*	*Electronic*	*Check annually with latest version IPCC Guideline*
131.10	*Annual average diesel consumption during agriculture operations per hectare rape (ADC_{rape})*	*national or local government or local farmer association*	l / ha	*e*	*annually*	*100 %*	*Electronic*	
131.11	*Annual average diesel consumption during agriculture operations per hectare sunflower ($ADC_{sunflower}$)*	*national or local government or local farmer association*	l / ha	*e*	*annually*	*100 %*	*Electronic*	
131.12	*Density of petroleum diesel ($density_{PD}$)*	*Source: EN 590:2004*	0,845 kg / l	*e*	*annually*	*100 %*	*Electronic*	
131.13	*Area fallow land in Bulgaria ($Area_{FL}$)*	*Ministry of Agriculture and Forestry; Republic of Bulgaria;http://www.mzgar.government.bg/MZ_eng/OfficialDocuments/Agry_report/Agry_report.htm; Annual reports/Annex 1*	ha	*e*	*annually*	*100 %*	*Electronic*	
131.14	*Area with agricultural purpose in Bulgaria ($Area_{AP}$)*	*Ministry of Agriculture and Forestry; Republic of Bulgaria;http://www.mzgar.government.bg/MZ_eng/OfficialDocuments/Agry_report/Agry_report.htm; Annual reports/Annex 1*	ha	*e*	*annually*	*100 %*	*Electronic*	
131.15	*Mass of purchased Crude oil in emergency cases ($m_{Crude\ Oil}$)*	*Plant data*	T	*e*	*monthly*	*100 %*	*Electronic*	
131.16	*Conversion factor of*	*1000 kg crops for 400 kg crude oil; for*	0,3	*e*	*Annually*	*100 %*	*Electronic*	

	mass crude oil per mass of cops ($CF_{CrudeOil/Crops}$)	*conservativeness 0,3*						

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

(12) $L_y = L_{Meth,y} + (L_{argo,y} + L_{PD,y} + L_{field,y}) \times Alpha_y + L_{CrudeOil,,y}$

(13) $L_{Meth,y} =: ME_y * EF_{Meth,pc}$

ME_y Amount of methanol consumed in bio-diesel plant per year (t)

$EF_{Meth,pc}$ Pre-reaction emission factor for methanol production (2,0 t CO_2 / t)

(14) $L_{argo,y} = (ADC_{rape} \times m_{rape,y}/ Y_{rape,y} + ADC_{sunflower} \times m_{sunflower,y}/ Y_{sunflower,y}) \times density_{PD} \times$
$\times EF_{CO2,petrod} \times 10^3$

ADC_{rape} Annual average diesel consumption per hectare rape (l / ha)

$ADC_{sunflower}$ Annual average diesel consumption per hectare sunflower (l / ha)

$Y_{rape,y}$ Annual average yield rape (t / ha)

$Y_{sunflower,y}$ Annual average yield sunflower (t / ha)

$m_{rape,y}$ Annual mass of purchased crops rape (t)

$m_{sunflower,y}$ Annual mass of purchased crops sunflower (t)

$density_{PD}$ density petroleum diesel (0,845 kg / l)

$EF_{CO2,petrod}$ Emission factor for petroleum diesel (3,18 t CO_2 / t)

(15) $L_{PD,y}$ =: (ADC_{rape} x $m_{rape,y}$/ $Y_{rape,y}$ + $ADC_{sunflower}$ x $m_{sunflower,y}$/ $Y_{sunflower,y}$) x $density_{PD}$ x x $EF_{BL\_PC,y}$ x 10^{-3}

ADC_{rape}	Annual average diesel consumption per hectare rape (l / ha)
$ADC_{sunflower}$	Annual average diesel consumption per hectare sunflower (l / ha)
$Y_{rape,y}$	Annual average yield rape (t / ha)
$Y_{sunflower,y}$	Annual average yield sunflower (t / ha)
$m_{rape,y}$	Annual mass of purchased crops rape (t)
$m_{sunflower,y}$	Annual mass of purchased crops sunflower (t)
$density_{PD}$	density petroleum diesel (0,845 kg / l)
$EF_{BL\_PC,y}$	Emission factor for pre-combustion from production of fossil fuels (t CO_2 / t)

(16) $L_{field,y} = \sum_i \left(\frac{Mcrop_{i,y}}{Y_{i,y}} \right) * EF_{N,i,y}$

$L_{field,y}$	Leakage from production of crops (t CO_2)
$Y_{i,y}$	Annual average yield feedstock per ha and crop i (t / ha)
	= Y_{rape} and $Y_{sunflower}$
$Mcrop_{i,y}$	Annual purchased mass of crop i (t)
	= $m_{,rape,y}$, $m_{sunflower,y}$
$EF_{N,I,y}$	Emission factor for enhanced N for crop i (t CO_2 / ha)

$$EF_{N,i,y} = EF_{FN,i,y} + EF_{FP,i,y} + EF_{RN,i,y}$$

$EF_{FN,I,y}$ Emission factor N_2O-emissions from fertilizer N applied to soil (t CO_2 / ha)

$EF_{FP,I,y}$ Emission factor for GHG-emissions associated with N-fertilizer production (t CO_2 / ha)

$EF_{RN,i,y}$ Emission factor for N_2O-emissions from crop residue N returned to soil (t CO_2 / ha)

(17) $EF_{FN,I,y} = m_{SN,I,y} \times EF_1 \times 44/12 \times GWP_{N2O}$

(18) $EF_{FP,I,y} = (m_{SN,I,y} - m_{RNEXI,y}) \times EF_2$

$EF_{RN,i,y} = (m_{RN,I,y} - m_{RNEXI,y}) \times EF_1 \times 44/12 \times GWP_{N2O}$

$m_{SN,I,y}$ Synthetic fertilizer-N applied to crop i in year y (kg N /ha)

$m_{RNEXI,y}$ Residue-N from crop i exported as fertilizer (= not returned to crop plantation i) (kg N / ha)

$m_{RN,I,y}$ Amount of residue-N from crop i that is returned to any soil (kg N / ha)

EF_1 Fraction of fertilizer N converted to N_2O-N (0,0125 kg / kg)

EF_2 Upstream emission from production of synthetic fertilizer (2,2 kg CO_2 / kg N)

GWP_{N2O} Global warming potential of N_2O (= 310 t CO_2 / t N_2O)

(19) $Alpha = Area_{FL} / Area_{AP}$

$Area_{FL}$ Area of fallow land in Bulgaria (ha)

$Area_{AP}$ Area with agricultural purpose in Bulgaria (ha)

(20) $L_{CrudeOil,,y} = (L_{argo,y} + L_{PD,y} + L_{field,y}) / (m_{rape,y} + m_{sunflower,y}) \times m_{CrudeOil,y} \times alpha / CF_{CrudeOil/Crops}$

$m_{rape,y}$	Annual mass of purchased crops rape (t)
$m_{sunflower,y}$	Annual mass of purchased crops sunflower (t)
$m_{CrudeOil,y}$	Annual mass of purchased crude oil in emergency cases (t)
$CF_{CrudeOil/Crops}$	Conversion factor for received mass of crude oil per mass crops [0,3]

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions / emission reductions in units of CO_2 equivalent):

$ER = BE_y - PE_y - L_y$

ER	Annual emission reduction	t CO_2
BE_y	Annual baseline emissions	t CO_2
PE_y	Annual project emissions	t CO_2
L_y	Annual leakage emissions	t CO_2

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions / emission reductions in units of CO_2 equivalent):

$ER = BE_y - PE_y - L_y$

ER	Annual emission reduction	t CO_2
BE_y	Annual baseline emissions	t CO_2
PE_y	Annual project emissions	t CO_2
L_y	Annual leakage emissions	t CO_2

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high / medium / low)	Explain QA / QC procedures planned for these data, or why such procedures are not necessary.
111.1	*low*	*No specific QA / QC procedures Astra Bio Plant, Plant record*
111.2	*low*	*Not necessary, national data is used.*
111.3	*low*	*No specific QA / QC procedures, Astra Bio Plant, Plant record*
111.4	*high*	*Check consistency of distances records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps)*
111.5	*low*	*Not necessary, Astra Bio Plant, Plant record*

111.6	*high*	*Not necessary, as IPCC or national data is used.*
111.7	*low*	*No specific QA / QC procedures Astra Bio Plant, Plant record*
111.8	*low*	*No specific QA / QC procedures Astra Bio Plant, Plant record*
111.9	*low*	*No specific QA / QC procedures, small impact on total emission reductions*
111.10	*high*	*Check consistency of distances records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps)*
111.11	*low*	*Not necessary, Astra Bio Plant, Plant record*
111.12	*low*	*No specific QA / QC procedures, small impact on total emission reductions*
111.13	*high*	*Not necessary, Astra Bio Plant, Plant record, small impact on total emission reductions*
111.14	*low*	*Not necessary, IPCC data is used.*
111,15	*low*	*Not necessary, IPCC data is used.*
111.16	*low*	*Not necessary, IPCC data is used.*
111.17	*low*	*Not necessary, IPCC data is used.*
111.18	*low*	*Not necessary, Astra Bio Plant, Plant record*
113.1	*low*	*No specific QA / QC procedures, data from Laboratory analysis by SGS BULGARIA LTD*
113.2	*low*	*Not necessary, as IPCC or national data is used.*
113.3	*low*	*Not necessary, as IPCC or national data is used.*
113.4	*high*	*Not necessary, source Swiss EcoInventory of Energy Systems, 2nd Edition, Vol. 1, 1995, p.245*
113.5	*low*	*Not necessary, as IPCC or national data is used.*
113.6	*low*	*Not necessary, Astra Bio Plant, Plant record*
113.7	*low*	*Not necessary, Astra Bio Plant, Plant record*
113.8	*low*	*Not necessary, Astra Bio Plant, Plant record*
113.9	*low*	*Not necessary, Data from Approval delivered by refineries*
113.10	*low*	*Not necessary, Data from Approval delivered by refineries*
113.11	*low*	*Not necessary, Data from Approval delivered by refineries*
113.12	*low*	*Not necessary, Data from Approval delivered by refineries*
113.13	*low*	*Not necessary, Data from Approval delivered by refineries*
131.1	*high*	*Not necessary, source http://edj.net/sinor/SFR4-99art7.html*

131.2	*low*	*Not necessary, Astra Bio Plant, Plant record*
131.3	*low*	*Not necessary, Astra Bio Plant, Plant record*
131.4	*medium*	*Not necessary, Plant records or as national or local government or farmer association data*
131.5	*medium*	*Not necessary, Plant records or as national or local government or farmer association data*
131.6	*medium*	*Not necessary, Plant records or as national or local government or farmer association data*
131.7	*low*	*Not necessary, IPCC data is used.*
131.8	*high*	*Not necessary, source http://www.fao.org/wairdocs/lead/x6113e/x6113e09.htm*
131.9	*low*	*Not necessary, IPCC data is used.*
131.10	*medium*	*Not necessary, as national or local government or farmer association data*
131.11	*medium*	*Not necessary, as national or local government or farmer association data*
131.12	*low*	*Not necessary, source of this data is EN 590:2004.*
131.13	*low*	*Not necessary, as national or local government or farmer association data*
131.14	*low*	*Not necessary, as national or local government or farmer association data*
131.15	*low*	*Not necessary, Astra Bio Plant, Plant records*
131.16	*high*	*Not necessary, Astra Bio Plant, Plant records, small impact on total emission reductions*

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

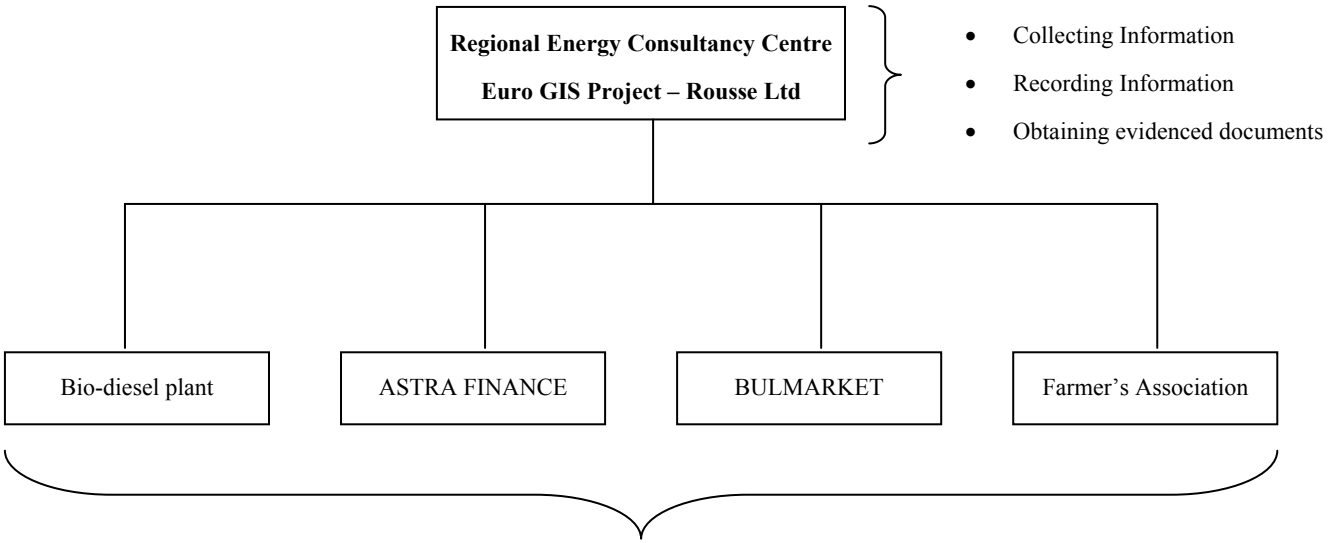


Illustration 19: Operational and management structure for implementing the monitoring plan

In addition, ASTRA BIO PLANT Ltd. has signed a Carbon Financing Service Agreement with Camco International Ltd. for the Astra bio-diesel project. This agreement forms the basis for the cooperation between Astra and Camco. In chapter "3.2 Realization of the asset" is noted that "Camco will ensure that all actions required for realizing and selling of the project's emission reductions are carried out including: the implementation of the monitoring plan on an annual basis in accordance with the method approved in the validated PDD." The actual monitoring process will be agreed upon between the parties in written form after registration of the project as a JI activity. In chapter "8 Obligations of Client" of this agreement is noted that ASTRA BIO PLANT Ltd. has to provide all information and data required for the qualification of the project as a JI activity. Such information includes actual and historical production data, fuel/energy use,

output/use of biological waste, other statistical data, feasibility studies, business plans, and planning documents related to the project. In addition, ASTRA BIO PLANT Ltd. will provide all information and data required for the monitoring of GHG-emissions in accordance with the monitoring plan (MP).

D.4. Name of person(s) / entity(ies) establishing the monitoring plan:

KWI Consultants GmbH, Fuhrmannsgasse 3-7, and 3100 St. Pölten, Austria in consultation with "Regional Energy Consultancy Centre Euro GIS Project - Rousse" (Co author), 2 A DOBRUDJA STREET, 7000 Rousse, Bulgaria, will establish the monitoring plan.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Project Emissions	Unit	2007	2008	2009	2010	2011	2012
Emissions from electricity consumption in ABP	t CO_2	3.940	7.272	6.392	6.135	6.070	5.992
Emissions from combustion methanol	t CO_2	6.188	12.375	12.375	12.375	12.375	12.375
Emissions from transport field to ABP	t CO_2	0	0	0	0	0	0
Emissions from transport of bio diesel	t CO_2	0	0	0	0	0	0
Emission CH4 from wastewater	t CO_2	181	181	181	181	181	181
Emission from consumption of hexan	t CO_2	111	221	221	221	221	221
Total Project Emissions	**t CO_2**	**10.419**	**20.049**	**19.170**	**18.912**	**18.848**	**18.769**

E.2. Estimated leakage:

Leakage Emissions	Unit	2007	2008	2009	2010	2011	2012
Emissions Diesel consumption during agricultural op	t CO_2	634	1.268	1.268	1.268	1.268	1.268
Emissions Pre-combustion emissions	t CO_2	100	199	199	199	199	199
Emissions from production of crops	t CO_2	2.078	4.157	4.157	4.157	4.157	4.157
Emissions from methanol production	t CO_2	9.000	18.000	18.000	18.000	18.000	18.000
Emissions associated with crude oil	t CO_2	0	0	0	0	0	0
Total Leakage Emissions	**t CO_2**	**11.812**	**23.624**	**23.624**	**23.624**	**23.624**	**23.624**

E.3. The sum of E.1. and E.2.:

Sum E.1 and E.2	Unit	2007	2008	2009	2010	2011	2012
Estimated Project Emissions	t CO2	10.419	20.049	19.170	18.912	18.848	18.769
Estimated Leakage	t CO2	11.812	23.624	23.624	23.624	23.624	23.624
Sum Emissions	**t CO2**	**22.231**	**43.673**	**42.794**	**42.537**	**42.472**	**42.394**

E.4. Estimated baseline emissions:

Baseline Emissions	Unit	2007	2008	2009	2010	2011	2012
$BE_{v,y}$	t	76.992	153.985	153.985	153.985	153.985	153.985
$BE_{BL\_PC,y}$	t	12.116	24.233	24.233	24.233	24.233	24.233
Total Basline Emissions	**t CO_2**	**89.109**	**178.217**	**178.217**	**178.217**	**178.217**	**178.217**

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

Emission Reduction	Unit	2007	2008	2009	2010	2011	2012
Baseline Emissions	t CO_2	89.109	178.217	178.217	178.217	178.217	178.217
Project Emissions	t CO_2	-10.419	-20.049	-19.170	-18.912	-18.848	-18.769
Leakage Emissions	t CO_2	-11.812	-23.624	-23.624	-23.624	-23.624	-23.624
Emission Reduction	**t CO_2**	**66.877**	**134.544**	**135.423**	**135.681**	**135.745**	**135.824**

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

Year	Estimated Project Emissions (t CO_2 equivalent)	Estimated Leakage (t CO_2 equivalent)	Estimated Baseline Emissions (t CO_2 equivalent)	Estimated Emissions Reductions (t CO_2 equivalent)
2008	-20.049	-23.624	178.217	134.544
2009	-19.170	-23.624	178.217	135.423
2010	-18.912	-23.624	178.217	135.681
2011	-18.848	-23.624	178.217	135.745
2012	-18.769	-23.624	178.217	135.824
Total (t CO_2 equivalent)	**-95.748**	**-118.122**	**891.086**	**677.216**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including trans boundary impacts, in accordance with procedures as determined by the host Party:

The environmental impacts were structured into three stages:

Sunflower and rape plantation

Bio-diesel and other bio-fuels are produced from renewable agricultural crops that assimilate carbon dioxide from the atmosphere while growing. The carbon dioxide released this year from burning will be used next year by crops to grow. In comparison with petroleum diesel bio-diesel is clean, safe, biodegradable and free of sulphur. The cultivation will partly revive currently unused land area with the improvement and maintenance of the fields. There won't be any negative impact. In addition, the residue of bio-diesel production feeds back to the plantation site as high quality organic fertilizer. Recycling of natural resources will be achieved.

Another point has to be considered: Do rape or sunflower growth in monocultures aggravate existing

threats to biodiversity? A threat to biodiversity can't be excluded completely, but due to the fact that rape and sunflower need a crop rotation there is a good argument for planting them. Crop rotation avoids a decrease in soil fertility, as growing the same crop repeatedly in the same place depletes the soil of various nutrients. A crop that leaches the soil of one kind of nutrient is followed during the next growing season by a dissimilar crop that returns that nutrient to the soil or draws a different ratio of nutrients. By crop rotation farmers can keep their fields under continuous production, without the need to let them lay fallow and reduce the need for artificial fertilizers. A crop rotation with at least 4 years between cultivation of rape or sunflower and other cruciferous crops is needed to avoid soil depletion. It is also not recommended to grow rape after sunflower or the other way round. It would have the same effect as growing rape/sunflower successively. Due to crop rotation other fruits and crops have to be planted in order to avoid soil depletion.
In addition, rape has not been cultivated in Bulgaria at all. Therefore the project activity will lead to even more biodiversity in the region of Rousse.

On the other side, synthetic fertilizer will be used too and the cultivation needs intensive care, especially while harvesting. Therefore, some negative impacts will arise from the use of agricultural machinery and synthetic fertilizer.

Bio-diesel production

Wastewater effluent of the plant is treated within the plant. The compliance of effluent regulation is checked before flashing to outer environment. On the base of the contract between ASTRA BIO PLANT Ltd. and ARHI ENGINEERING Ltd. a water treatment plant will be constructed in the area of the plant (item 4.2 on the plant area map). The water treatment plant is manufacture produced and will be covered and fully insulated in container. The equipment will be delivered by company ELFI TEX Ltd., city of STARA ZAGORA. Inlet water quantity will be 4 m^3 / h and quality of the outlet water will in accordance with the following regulation:

MINISTRY OF ENVIRONMENT AND WATER
MINISTRY OF REGIONAL DEVELOPMENT AND PUBLIC WORKS
MINISTRY OF HEALTH
MINISTRY OF ECONOMY
REGULATION No. 6
of 9 November 2000
on the Limit Values for Admissible Contents of Dangerous and Harmful Substances in the Waste Water Discharged in the Water Bodies

Promulgated, State Gazette No. 97/28.11.2000

Purified water will be discharged in the existing canal connected to the Danube River.

After the conclusion of all approval procedures the production plant will be in compliance with all legal regulations.

Bio-diesel consumption

In comparison with petroleum diesel bio-diesel not only reduces CO_2-emissions, but also other air pollutants such as soot, particulates, carbon monoxide (CO), hydrocarbons and air toxics. On the other side, the emission of NO_x is higher than while combusting petroleum diesel.

Glycerin is a by-product of the bio-diesel production. If it is sold to the chemical manufacturers and used as a feedstock of chemical substance, additional transports will occur.

Due to the fact that the construction and operation of the bio-diesel plant will lead to a higher volume of traffic there will arise additional environmental impacts (GHG-emissions, noise etc.). Nevertheless the production plant is subject to the IPPC Directive (Directive 96/61/EC concerning integrated pollution prevention and control, Annex 3). The EU set common rules for permitting and controlling industrial installations in that directive. The integrated approach means that the permits must take into account the whole environmental performance of the plant, covering e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, traffic, prevention of accidents and restoration of the site upon closure. The purpose of the Directive is to ensure a high level of protection of the environment taken as a whole. Since Bulgaria entered the European Community at the beginning of 2007 this directive has to be considered by the authorities.

Transboundary effects

The Danube River is the border river to Romania. Due to this fact potential transboundary effects have to be considered and counteracted. The wastewater effluent is treated within the plant and just purified water will be discharged in the existing canal connected to the Danube River. The Rousse design company ARHI ENGINEERING Ltd. is in charge of designing the waste water treatment plant for treatment of the whole water from technological processes of the bio-diesel plant. The quality of the treated water has to meet the requirements of the “Regulation No 6/09/11/2000” by the MOEW. Chapter 5, Art.18 of this regulation describes all procedures for monitoring of treated water.

The Rousse region is situated at the border to Romania. Therefore air pollution, which is caused by the bio-diesel plant, can also affect the Romanian State. According to the "Regulation No 8/03/05/1999" by the MOEW the contents of ozone in the atmosphere should not exceed 110 mg / m³ calculated as average quantity for a period of 8 hours. The plant will be constructed according to all regulations, legal frameworks, etc. to prevent any illegal, harmful emissions within Bulgaria and other (neighboring) countries. In addition, the Letter of Support issued by the MOEW requires a positive Environmental Impact Assessment Decision.

ASTRA BIO PLANT Ltd. will meet all required standards to limit transboundary effects.

Import of Sunflower seeds and rapeseeds are not foreseen in the project.

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

No significant environmental impacts are considered.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

Identification of stakeholders

The following stakeholders were identified for the project activity:

- Local population (inhabitants of the Rousse region)
- Local government (municipality of city SLIVO POLE)
- Bulgarian Ministry of Environment and Water
- Ministry of Environment and KPC (Kommunalkredit Public Consulting)

Stakeholder information process

The project proponent already sent the first Project Idea note (PIN) to the Bulgarian Ministry of

Environment and Water about the proposed project in February 2006. After that, the project owner was in brisk contact with the ministry and informed it regularly about the progress. As a result of all procedures to comply with all regulations a complex building permit will be obtained from MOEW. That permit includes permit and operating license to operate the production plant.

The first letter was sent to the mayor of the city of SLIVO POLE at the beginning of April 2006. Several discussions and negotiations with the municipality, the mayor and local authorities followed. All have expressed very positive position and willing for support on the proposed project. Those positive opinions are related to the expectation for creation of new jobs, increasing of economical conditions and rural transport in the region.

Project proponents have published a public announcement in local newspapers "UTRO" at 1st April 2006, inviting public comments on the project. The notice indicates the project description and location of the project. The public notice was published in the entire district region, where the plant is situated. Apart from the public notice, regular public meetings were convened by the project owners. Since May the project owner is organizing every month a meeting with farmers, insurance company representatives, bank representatives etc. Those events are organized in cities close to the Rousse region. The topic of those events is "Production of Rape and Sunflower – Alternative of the Future". The speakers are representatives of the Institute of Plant Genetic Resources, city of Sadovo. The first meeting in the city of Rousse was held during May and the audience consisted of 45 farmers, the insurance company BULSTRAD Ltd., First Investment Bank branch Rousse and citizens.

Public Monthly Meetings

Organizers:

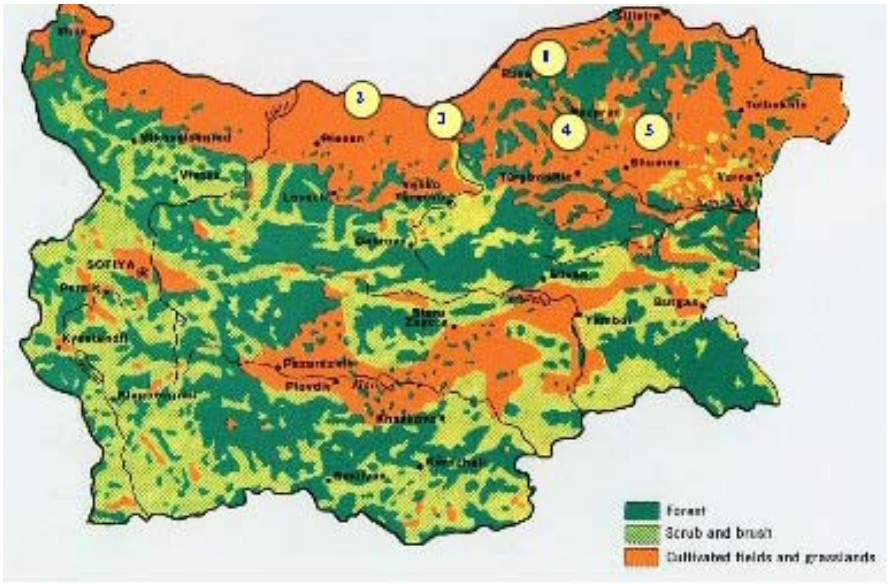
ASTRA FINANCE and ASTRA BIO PLANT

Lecture: Mr. ANGELOV, Research Associate

Institute of Plant Genetic Resources, Sadovo, Bulgaria

Month	Location	Objectives	Participants
May 2006	City of Rousse City Conference Hall	Crowing of sunflower and rape plants as an alternative raw material for the future bio-fuel - Review - Plantation - Climate condition in the region - Legislation for stimulating - Risk assessment	Representatives of organizer Farmers (45) First Investment Bank – Branch Rousse BULSTRAD – Insurance Company
July 2006	City of Pleven City Conference Hall	Crowing of sunflower and rape plants as an alternative raw material for the future bio-fuel - Review - Plantation - Climate condition in the region - Legislation for stimulating - Risk assessment	Representatives of organizer Farmers (39) BULSTRAD – Insurance Company
August 2006	Town of BALGARENE Municipal Conference Hall	Crowing of sunflower and rape plants as an alternative raw material for the future bio-fuel - Review - Plantation - Climate condition in the region - Legislation for stimulating - Risk assessment	Representatives of organizer Farmers (11) BULSTRAD – Insurance Company
September 2006	City of POPOVO Municipal Conference Hall	Crowing of sunflower and rape plants as an alternative raw material for the future bio-fuel - Review - Plantation - Climate condition in the region - Legislation for stimulating - Risk assessment	Representatives of organizer Farmers (20) First Investment Bank BULSTRAD – Insurance Company

Illustration 20: Protocol of the public meetings



1 Rousse Region, City of Rousse

2 Region of PLEVEN, City of PLEVEN

3 Region of PLEVEN, City of BALGARENE

4 Region of RAZGRAD, City of POPOVO

5 Region of SHOUMEN, City of SHOUMEN

Illustration 21: Locations of the public meetings

The purpose of the public notice and meeting was to inform all stakeholders, invite comments on the project and participate in the stakeholder meetings.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organization:	**ASTRA BIO PLANT Ltd.**	
Street/P.O.Box:	100 TUTRAKAN Boulevard	
Building:		
City:	Rousse	
State/Region:	Rousse	
Postal code:	7000	
Country:	Bulgaria	
Phone:	00359 888 242 051 or 00359 82 84 48 61	
Fax:	00359 82 84 48 62	
E-mail:	d_dimova@bulmarket.bg	
URL:		
Represented by:		
Title:	Technical Manager	Office Manager
Salutation:		
Last name:	Ganev	Dimova
Middle name:		
First name:	Vasil	Denitsa
Department:		
Phone (direct):		00359 82 84 48 61
Fax (direct):		
Mobile:	00359 888 242 051	
Personal e-mail:		

Annex 2

BASELINE INFORMATION

Annex 3

MONITORING PLAN