Feasibility Study Report
Medan, Indonesia

Tasks 1 thru 10 Submittal
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Prepared for: **PT Perkebunan Nusantara III Biodiesel Refinery and Biomass Energy Plant**

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cc: HS, CS, GT, JW, RD, JS, MG, PD
MC, PM, DR

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0.1 ECONOMIC AND FINANCIAL FEASIBILITY

0.1.1 Estimated Project Cost

The engineer's opinion of probable construction cost for the 100,000 tonne per year biodiesel plant and 10 MW biomass waste-to-energy plant is US$85.5 million, including equipment and materials, labor, contractor overhead and profit, design engineering and 25% contingency.

0.1.2 Economic Feasibility

The economics of a new 100,000 tonne per year biodiesel plant and 10MW biomass waste-to-energy plant suggest that the project is feasible for PTPN-III to proceed. The Internal Rate of Return (IRR) is 61.4% and the Net Present Value (NPV) is US$122,289,000. PTPN-III's estimated cost of capital based on their current costs of equity and debt is 16.4% and is used as the discounting basis for the NPV calculation.

When considering the case in which market cost of Crude Palm Oil (CPO) is included in the raw materials cost, the IRR is 6.8% and the NPV is US$ (37,051.00).

0.1.2 Financial Feasibility

A preliminary survey of financial institutions and commercial project finance banks in Singapore indicates that limited recourse project finance amortizing development facilities may be made available to PTPN-III for up to 70% of the project capital cost. The debt service coverage ratios for the project score significantly higher than what typical banks require because of the strong free cash flow of the project.

0.2 EVALUATION CRITERIA

0.2.1 Plantation Sustainability

The existing Sei Mangkei plantation demonstrates a sustainable output for both the current Crude Palm Oil (CPO) and future Biodiesel production. Fresh Fruit Bunch (FFB) required for biodiesel production is 500,000 tonne per year and current plantation output is just over 2,000,000 tonne per year, increasing to 3,000,000 tonne per year by 2018. Task 1 of this study identifies an improved cropping rotation plan that improves plantation yield over time to contribute to additional plantation sustainability.

0.2.2 Technical Feasibility

Tasks 1 and 2 of the Study identify commercially-proven technologies for biodiesel manufacture and biomass waste-to-energy. Desmet, Lurgi, and Greenline Industries process technologies are presented and a survey of POME treatment, Methane Gas Capture, and Biomass waste-to-energy technologies are identified and evaluated based on initial capital cost and long-term energy conversion. The report identifies the three biodiesel process technologies as substantially equivalent from a commercial perspective and recommends a biomass furnace with two-stage condensing turbine-generator set.

0.2.3 Economic and Financial Feasibility

Tasks 3 and 4 present an in-depth analysis of CPO and Biodiesel market trends in an attempt to approximate a stable price and demand basis. Our analysis indicates that CPO prices may stabilize near US$800 per tonne in the long run and that Biodiesel prices will grow at approximately 4.5% annually from today's current price of approximately US$1,250 per tonne. The economic analysis is based on a detailed cash flow pro-forma analysis to determine Net Present Value (NPV) and Internal Rate of Return (IRR) and a sensitivity switching factor analysis is used to determine feasibility thresholds of the project with respect to raw material costs, product price, and product volume.

0.2.4 Regulatory

Task 5 of the Study analyzes and provides a step-by-step action plan for PTPN-III to apply for commercial licenses, operating permits, and project development permits based on North Sumatera and Government of the Republic of Indonesia regulations.

0.2.5 Environmental and Developmental Impact

Tasks 6 and 7 of the Study evaluates the project against International Finance Corporation (IFC), World Bank, and Roundtable on Sustainable Palm Oil (RSPO) criteria. The report outlines an implementation action and monitoring plan to meet the requirements of these criteria.

0.3 EVIDENCE

Material sources are cited throughout the report as evidence for the commercial and market analysis. Primary sources include the U.S. Department of Agriculture, past performance of the existing PTPN-III plantation and CPO mill, and the International Energy Agency. Cash flow pro-formas are based on an analysis of PTPN-III's 2005 and 2006 annual report to determine the corporation's cost structure and income statement performance.

0.4 RECOMMENDATIONS

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0.4.1 Offtakes

Prime Engineering recommends conducting formal negotiations with Pertamina for the biodiesel offtake contract terms and PLN for the power purchase agreement terms based on the draft offtake agreements that are presented in Section 8 of this report.

0.4.2 Project Finance

Prime Engineering recommends that PTPN-III seek an amortizing development facility to finance the capital cost of the project, securing the loan with their existing CPO revenue stream. PTPN-III may also seek a separate revolving working capital facility to fund a portion of our estimated US$13.5 million working capital requirement.

TASK 1: PRELIMINARY REVIEW

SECTION 1 – PRELIMINARY REVIEW, DATA COLLECTION & SITE VISIT (TASK 1)

1.1 INITIAL DATA COLLECTION

1.1.1 Biodiesel Process Technologies

The study will provide analysis and recommendations on the technologies indicated in Table 1.1, below.

Table 1.1: Technology Licensors

Process Technology	Catalyst	Key Advantages/Disadvantages
Lurgi	Sodium Methylate	Material of construction is carbon steel for the reactor and titanium for the reboiler (5 years of free maintenance). Delivery schedule: package equipment 12 months, shipment 1 month, field erection 3 months. Total: Ready for commissioning in 16 months. Fatty acid is separated from the feedstock for downstream processing by other technologies (not included in Lurgi package). Design capable of producing pharmaceutical-grade glycerin.
DeSmet Ballestra	Sodium Methylate	Pre-treatment plant is regarded as the best in its class. Fatty acid is treated to become biodiesel through trans-esterification process. Glycerin byproduct can be processed to pharmaceutical grade.
Greenline Industries	Sodium Methylate	US-based manufacturer. Furnishes pre-engineered "pipe-to-pipe" skid-mounted processing units that can be easily incorporated into PTPN-III plant design.

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		Uses a resin ion exchange waterless wash system. Trans-esterification unit and multi-feedstock capability for oils with less than 5 acid value.

An initial technology selection workshop was conducted by PT Tracon Industri at PTPN-III's office on 8 April 2008. At this workshop, technology key factors were discussed and a decision methodology was agreed on. The feasibility study analysis will base the technology selection on the following criteria:

- Plant performance (guaranteed conversion and efficiency)
- Plant configuration (complexity and cost of installation)
- Process technology (track record and quality of performance)
- Major equipment (costs, operability, delivery schedule)

1.1.2 Preliminary Cost Estimates

The information presented in Table 1.2 indicates budgetary cost estimates for procurement of the main methylester process technology equipment and turbine generator equipment. These estimated costs do not include other facility construction costs; these will be developed during Task 2: Technical Analysis. The budgetary cost estimates are at an accuracy of plus or minus 30%, which is an appropriate accuracy level for a feasibility study.

Table 1.2: Cost and Delivery Estimates

Main Equipment Item	Budgetary Procured Cost	Approximate Delivery
100,000-MT/y Biodiesel Process Unit including glycerin and methanol recovery	US$ 11,600,000	40 weeks
Biomass Furnace / Boiler Packaged System	US$ 16,000,000	60 weeks
11.5-MW steam turbine generator set	US$ 6,000,000	70 weeks

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1.1.3 Raw Material Availability

The current plantation consists of about 103,424 hectares, of which approximately 96,858 hectares are currently growing palm trees. About 6,566 hectares could be brought into production.

The current distribution of palm trees by age is indicated in Table 1.3, below.

Table 1.3: Plantation Tree Age Distribution

Tree Age Group	Distribution	Estimated Land Area (hectares)
Under 2 years	9.4%	9,105
2 to 5 years	29.95%	29,009
6 to 10 years	13.0%	12,592
11 to 15 years	13.16%	12,747
16 to 20 years	2.41%	2,334
Over 20 years	32.08%	31,072

Note that the distribution of trees by age group is not symmetrical. There are large populations of trees in the 2-to-5-year and over-20-year age groups and comparatively small populations in the under-2-year and 16-to-20-year age groups.

Historical plantation yield information at Sei Mangkei, provided by PTPN, will be used in the plant capacity calculations and is indicated in Table 1.4, below.

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Table 1.4: Historical Sei Mangkei Yield

Year	Fresh Fruit Bunches (tonnes per hectare)
2002	16.453
2003	17.861
2004	20.133
2005	20.226
2006	21.103
2007	20.225
2010	22.31 projected

The proposed biodiesel plant has a design capacity of 100,000 tonnes per year. The plantation output to support this capacity is estimated below based on industry typical palm oil to methylester yields.

- The Crude Palm Oil (CPO) yield of Fresh Fruit Bunches (FFB) is approximately 22%.
- Refined, Bleached and Deodorized (RBD) palm oil yield from CPO is approximately 95%.
- Methylester (biodiesel) yield from RBD palm oil is approximately 95%.

Thus, the biodiesel plant will require approximately 111,000 tonnes of CPO for full operation. That implies the need for about 500,000 tonnes of FFB annually to supply the biodiesel plant.

1.1.4 Existing and Proposed Land Usage

The methylester refinery and biomass energy plant will be located at the existing Sei Mangkei plantation and mill site. The plantation's existing land usage is measured as follows:

- Plantation productive area = 70,000 ha
- Plantation total area = 103,000 ha

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- Replantation = 6,566 ha
- Seeding = 207 ha
- Non-productive (3 years and less in age) = 26,000 ha

The proposed refinery and waste-to-energy estimated land usages are indicated in Table 1.5 below. The conceptual site plan is included in Section 2 of this report.

Table 1.5: Proposed Site Land Usage

Section	Estimated Land Usage (m^2)	Estimated Land Usage (hectare)
CPO pre-processing	1,400	0.14
Refinery	1,400	0.14
Waste-to-energy plant	2,100	0.21
Water treatment	2,800	0.28
Tank farm	3,500	0.35
Loading rack	700	0.07
Buildings, Site Infrastructure, and Retention Ponds	28,000	2.80
TOTAL	**39,900**	**3.99**

1.2 COLLECT DATA FOR WASTE-TO-ENERGY STUDY

1.2.1 The purpose of this task is to collect data that will be used in Task 2: Technical Analysis. This initial data collection task identifies the Task 2 scope for assessing the feasibility of developing a refinery and plant.

1.2.2 Availability of Waste Oil Feedstock

Biomass residue generated from the oil palm production process such as Empty Fruit Bunches (EFB), fibers, and kernel shells can be utilized as fuel for combustion boilers.

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Table 1.6, below, presents an estimate of the proportions of waste feedstock available annually for the PTPN-III project. This table is based on study data from the Graduate School of Energy Science at Kyoto University.

Table 1.6: Annual Mass Balance

Component	Input (MT/y)	Usable Product (MT/y)	Waste Product (MT/y)
Fresh Fruit Bunch	500,000		
Palm Oil		110,000	
Palm Kernel		25,000	
Empty Fruit Bunch			115,000
Fiber			70,000
Shell			30,000
Unusable Waste Material and Water			150,000

1.2.3 Bioelectricity from Palm Oil Mill Effluent (POME)

1.2.3.1 Technology Description

POME can be collected in covered treatment ponds and allowed to undergo an anaerobic digestion process to release biogas at a rate of approximately 12 cubic meters of gas per tonne of FFB processed.

PTPN-III has reported that it generates POME at a rate of approximately 60% of palm FFB capacity, equating to 300,000 tonnes annually.

The biogas is composed of approximately 65% methane and 35% carbon dioxide. The ponds are covered and the methane biogas is captured via a centralized duct system. The methane biogas is combusted in commercially available gas engines and linked to individual generators. The gas engines are limited in size, so multiple engines and generator sets are required.

1.2.3.2 Physical Characteristics

Use of EFB and palm fibers at the harvesting rate of 500,000 tonnes per year and a POME generation rate of 300,000 tonnes per year would yield

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approximately 6 million cubic meters of methane from the POME biogas. This would generate a total of approximately 18.3 million kW/h in one year. Assuming 6,650 operating hours per year, the power generation rate is approximately 2.8 MW.

1.2.3.3 General Cost Estimate

The investment to cover the POME treatment ponds and install methane capture equipment and gas engines is approximately US$5 million. A separate power plant investment company is interested in developing a side stream power plant under the Kyoto Protocol Clean Development Mechanism (CDM) project scheme. This company has offered to share the capital costs with PTPN-III under the following general arrangement:

PTPN-III provides capital for:

- Gas Engines
- Generator Sets
- Synchronizing Switchgear and Substation

The power plant investment company provides capital for:

- Treatment Ponds
- Digesters
- Gas Collection
- Final Effluent Treatment and Discharge

Under this agreement, PTPN-III would receive all revenue proceeds from the sale of power and the other company would receive all revenue proceeds from the sale of carbon credits under the Kyoto Protocol CDM.

1.2.4 Empty Fruit Bunches and Fiber for Boiler Fuel

1.2.4.1 Technology Description

Biomass residue consisting of EFB, fiber, and shell material will be generated at a rate of approximately 55,800 kg/h during operation. The USTDA Definitional Mission Report indicates a power generation rate of 4.8 MW and a fuel calorific value of 6.028 MJ/kg (Higher Heating Value, HHV, at 65% moisture). Our estimates, which are based on other published data (indicated below) and account for fuel values of shell and fiber, yield approximately 11.5 MW gross power output.

The technology employed is a traditional biomass direct combustion furnace. The heat from the furnace exhaust generates 91,666 kg/h of 20

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bar(g) saturated steam with a latent heat of 2,800 kJ/kg. Steam is sent to a condensing steam turbine. To provide process heat to the biodiesel plant for CPO drying, methylester drying, and methanol distillation, we have assumed a low-pressure extraction from the steam turbine of 33,500 kg/h at 2.5 bar(g). Cooling water at 90°C is used in a condenser immediately at the outlet of the steam turbine operated at 75-100 mm Hg vacuum (approximately 0.1 bar[g])to improve power generation by capturing latent heat as the steam condenses.

By comparison, a standard backpressure steam turbine without condensation would generate only 6.0 MW, which is a closer estimate to the USTDA Definitional Mission Report.

Low-pressure steam for internal heating will be used in the following manner:

- Extracted from the boiler, reduced in pressure to 2.5-3.0 bar(g), and desuperheated
- Extracted from an uncontrolled extraction port on the steam turbine
- Steam consumption is approximately 500 kg steam/tonne FFB in the palm oil mill
- Steam consumption in the biodiesel refinery (covered in Section 2 of this report)
- The methanol reboiler requires higher temperatures than other parts of the process, with the reboiler return stream at 150° C minimum, which may require a higher steam pressure.

Characteristics for the use of power, developed in detail in Section 2 of this report, are:

- Power consumption in the CPO mill is 17 kW per ton FFB processed.
- The existing CPO mill operating at 30 tonnes/hour FFB produces 3.6 MW in its boiler and generator set. It uses EFB and some shell, but no fiber.
- Power demand for the CPO mill will increase when it is expanded to 75 tonnes/hour FFB.
- PTPN-III wishes to have standalone power plants for the CPO mill and biodiesel refinery. PTPN-III would like to use as much EFB as possible in the CPO mill power plant, and the remaining materials in the biodiesel power plant.

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1.2.4.2 Physical Characteristics

A summary of physical properties used for this estimate is presented in Table 1.7, below. The column for "Calorific Value" are fuel values from the literature (Source: *Costa The Energy Balance In The Production Of Palm Oil Biodiesel - Two Case Studies: Brazil And Colombia*).

Table 1.7: Fuel Values	
Component	**Calorific Value (MJ/kg)**
Shell	18.4
Fiber	11.2
EFB	19.3

1.2.4.3 General Cost Estimate

The budgetary cost estimate for an Elliott condensing steam turbine generator set operating at 5600 RPM with 33,500 kg/h uncontrolled low-pressure steam extraction and 11 MW 50 Hz generator set including controls and synchronizing switchgear is US$6,000,000, FOB Pennsylvania, USA.

1.2.5 Empty Fruit Bunches for Ethanol and Methanol Production

1.2.5.1 Technology Description

Lignocellulosic biomass found in palm oil waste material (e.g., fiber, shells, and portions of empty fruit bunches) can be processed to basic alcohols such as ethanol and methanol through a hydrolysis-fermentation technology. Most commercially available technologies specialize in ethanol with approximately 35% thermal efficiency. Portions of our analysis are based on findings from the publication *Ethanol from Lignocellulosic Biomass: Techno-Economic Performance in Short-, Middle-, and Long-Term* by Hamelinck et al.

The cellulosic part of the biomass can be converted to sugars through the hydrolysis process. These sugars are then fermented to ethanol. Overall ethanol yield is dependent on the types of microorganism enzymes used and the hemicellulosic composition of the biomass. The portion of biomass that can be converted to ethanol is the cellulose and hemicellulose polymer chains, which can be approximately 60% of the biomass material. The remainder of biomass material is lignin, which cannot be processed by normal enzymatic technologies. The lignin material may be used as a boiler fuel.

Overall conversion to final ethanol product from cellulosic biomass is approximately 35%. For the PTPN-III project, there will be approximately 57,000 kg/h of EFB biomass available, converting to approximately 20,000 kg/h ethanol product.

1.2.5.2 Physical Characteristics

The basic process steps in the biomass-to-alcohol process are as follows:

- **Mechanical Pre-Treatment:** Cleaning and size selection of biomass raw material. Cleaning requires use of internal low-pressure steam. Desired particle size of biomass material for the process is 1-3mm.

- **Lignin Removal and Hemicellulose Hydrolysis:** Pre-treatment step to remove surrounding hemicelluloses and lignin to improve digestibility by enzymes. The product is filtered and pressed. Cellulose and lignin solids are sent to cellulose hydrolysis, and liquids (sugars) are sent to the fermentation unit.

- **Cellulose Hydrolysis:** Cellulose materials are converted into glucose sugars during a reaction catalyzed by dilute or concentrated acids or cellulase enzymes. The hydrolysis reaction is carried out between 160 and 220° C. Sugar yields are 50-90% for acid-catalyzed processes and 75-95% for enzyme-catalyzed processes.

- **Fermentation:** The glucose sugars are fermented to alcohols in the presence of various microorganisms including bacteria, yeast, and fungi. The theoretical maximum yield is approximately 0.51 kg ethanol/0.49 kg carbon dioxide per 1.0 kg of sugar.

- **Product Recovery:** Distillation of ethanol from cell mass and water followed by concentration in a rectifier to just below the ethanol/water azeotrope (95% by mass).

1.2.5.3 General Cost Estimate

The approximate total cost of system components including pre-treatment, hydrolysis and fermentation, distillation and purification, and separation is approximately US$55 million.

1.2.5.4 Tradeoff with Power Generation Options

The total biomass generated by the CPO mill may be used as a fuel, a raw material for ethanol production, or both. In the case of both, the biomass would be used for the minimum steam and power requirements and the remainder for ethanol production. Note that the table below indicates only estimated revenue amounts, not profit margins. The margin for ethanol production is very low, where the margin for power sale to PLN is very high.

1.2.6.2 Physical Characteristics

The activated carbon production process would not be conducted by PTPN-III at the Sei Mangkei site. Instead, the shell material would be separated from the other waste materials by selective screening or hopper, hammermill grinding, chipping, and disk refining.

1.2.6.3 General Cost Estimate

The screening system, consisting of feed conveyor, separators, hammermill, and collection bin, is approximately US$640,000.

1.2.6.4 General Market Overview

- **General Market Conditions:** The market is generally saturated with activated carbon raw material. Price is elastic (supply and demand readily affect price).

- **Potential PTPN-III Capacity:** The CPO mill generates approximately 56,000 kg/h of EFB biomass including water and FFA, which is approximately 50,000 kg/h EFB dry basis. Assuming some conversion and efficiency losses of 15%, PTPN-III might expect to generate 283,000 tonnes per year of activated carbon raw material.

- **Potential Revenue:** Historic pricing of activated carbon finished product is US$2.30 to 2.50 per kilogram. Yield of dry basis raw usable material (EFB biomass) to activated carbon is approximately 23%; however, a detailed analysis of usable material in the EFB biomass is not available. A comparable commercial scale facility that produces 7,000 tonnes per year of activated carbon using 45,000 tonnes per year of usable biomass would cost US$9 million with annual sales of US$6.5 million.

1.2.7 Waste Product Disposal General Recommendations

Based on the economics discussed regarding the waste product alternatives, the recommended alternative is EFB for boiler fuel due to a few key factors:

a) Potential for full offtake by PLN of surplus energy produced at a rate of:
   - IDR 525 per kWh under 2008 Ministry of Energy Decree #269
   - IDR 1,891 per kWh under 2006 Ministry Decree #2. The purchase price for electricity is 80% of BPP (basic grid generation cost) and will come from renewable energy power plants at IDR 1,512 per kWh.

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The biodiesel (methylester) product specifications will be in accordance with both EN 14214 and ASTM 6751-03:

Table 1.10: European Biodiesel Standards

Property	Unit	Limits EN 14214	
		minimum	maximum
Density at 15° C	kg/m³	860	900
Viscosity at 40° C	mm²/s	3.5	5.0
Flash Point Range	°C	120	
Cold Test CFPP (*)			Summer max 0° C Winter max -20° C
Sulfur Content (**)	mg/kg		10
Carbon Residue (**)	%(m/m)		0.3
Acid Value	mg KOH/g		0.5
Cetane Number (**)		51.0	
Ash Content (**)	%(m/m)		0.02
Water Content	mg/kg		500
Sediment (**)	rating		0.05
Total Contamination	hours		24
Copper Corrosion	% (m/m)	Class 1	
Oxidation Stability (**)	% (m/m)	6	
Ester Content	% (m/m)	96.5	
Methanol Content	% (m/m)		0.2
Monoglycerides Content	% (m/m)		0.8
Diglycerides Content	% (m/m)		0.2
Triglycerides Content	% (m/m)		0.2
Free Glycerin Content	% (m/m)		0.02
Total Glycerin Content	% (m/m)		0.25
Iodine Number (**)			120
Phosphorus	mg/kg		10
Alkali Content (Na+K)	mg/kg		5

(*) The Cold Flow Pour Point (CFPP) limit can be achieved based on feedstock blends' physical characteristics.

(**) Values based on raw material specifications are not influences by the trans-esterification process.

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Table 1.11: United States Biodiesel Standards

Property	Unit	Limits ASTM 6751-03	
		minimum	maximum
Density at 15° C	kg/m^3		
Distillation	% at °C	90%, 360° C	
Viscosity at 40° C	mm^2/s	1.9	6.0
Flash Point Range	°C	130	
Cold Test CFPP (*)			
Sulfur Content (**)	mg/kg		15
Carbon Residue (**)	%(m/m)		
Acid Value	mg KOH/g		0.8
Cetane Number (**)		47.0	
Ash Content (**)	%(m/m)		0.02
Water Content	mg/kg		500
Sediment (**)	rating		0.05
Total Contamination	hours		
Copper Corrosion	% (m/m)		
Oxidation Stability (**)	% (m/m)	6	
Ester Content	% (m/m)	96.5	
Methanol Content	% (m/m)		
Monoglycerides Content	% (m/m)		
Diglycerides Content	% (m/m)		
Triglycerides Content	% (m/m)		
Free Glycerin Content	% (m/m)		0.02
Total Glycerin Content	% (m/m)		0.24
Iodine Number (**)			
Phosphorus	mg/kg		10
Alkali Content (Na+K)	mg/kg		

(*) The Cold Flow Pour Point (CFPP) limit can be achieved based on feedstock blends' physical characteristics.

(**) Values based on raw material specifications are not influences by the trans-esterification process.

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The selected technology and operation of the plant will produce the purified and concentrated glycerin product according to the specifications indicated in Table 1.12, below.

Table 1.12: Refinery Performance	
Property	**Guarantee Figures**
Glycerin Content % by mass	82-85
Methanol % by mass	< 0.1
M.O.N.G. % by mass	< 1.5
Salt % by mass	< 7
Water % by mass	Balance

1.3.3 Feedstock Availability and Quality

1.3.3.1 Volume Projections

The following is a 10-year projection of the tree age distribution of the plantation for the period 2009 - 2018 (based on projected yields) and the resulting production from the plantation (based on changing tree age distribution).

There are several assumptions underlying the analysis:

a) The assumed economic life of a palm tree is 25 years. After the age of 25 years, the tree becomes too large to easily harvest the crop. Trees will be cut down at age 26 and the land will be replanted with one-year-old seedlings.

b) Seedlings will spend one year in a nursery before being planted in the plantation.

c) There is no production from trees less than three years of age.

d) Tree productivity increases during its economic life given adequate rainfall, fertilization, and pest and disease control. The estimated average base yields of trees benchmarked against the plantation overall average by age group is as follows:

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Table 1.13: Yield Contribution by Age Group	
Tree Age Group Average	**Average Yield per Hectare Compared to Total Plantation Average**
Under 2 years	0%
2 to 5 years	29%
6 to 10 years	86%
11 to 15 years	136%
16 to 20 years	167%
Over 20 years	189%

The data in the table above can be interpreted as follows: For the 16-to-20-year age group, its average yield is 167% of the entire plantation average yield per hectare, meaning if the entire plantation consisted of trees in this age group, its yield would be 1.67 times its current yield. This observation suggests that older palm plantations are more productive than younger ones. The above data was derived from a long-term study of production of similar palm plantations.

e) Yield increases through time were developed using data from the period 2002 - 2007 and projecting a linear trend forward to the year 2018. This assumes adequate rainfall, customary management, and continued introduction of genetically improved seedlings. The following chart illustrates the assumed yields:

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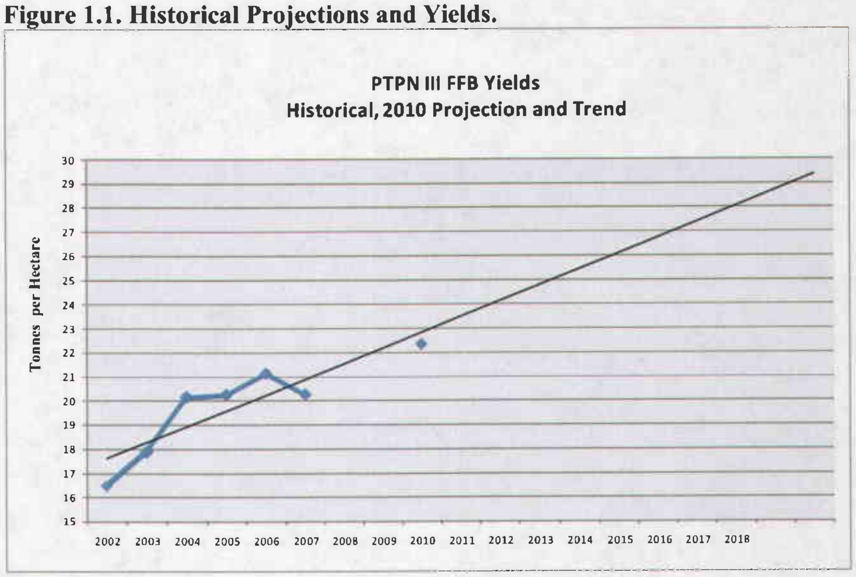
Figure 1.1. Historical Projections and Yields.



f) Area planted with palm trees will remain constant over time. Total land planted with palm trees will remain at 96,858 hectares but can be increased by 6,566 hectares if desired.

g) It is assumed that there are no trees older than 25 years in the plantation and that in any future year, 20% of all trees in the over-20-year age group will be removed and replaced with seedling trees. In the younger age groups, 20% of each group will advance to the next age group each year, except for trees aged 2 to 5 years, of which 25% will advance each year. The following chart illustrates how the age group makeup of the plantation will change over time under this regimen.

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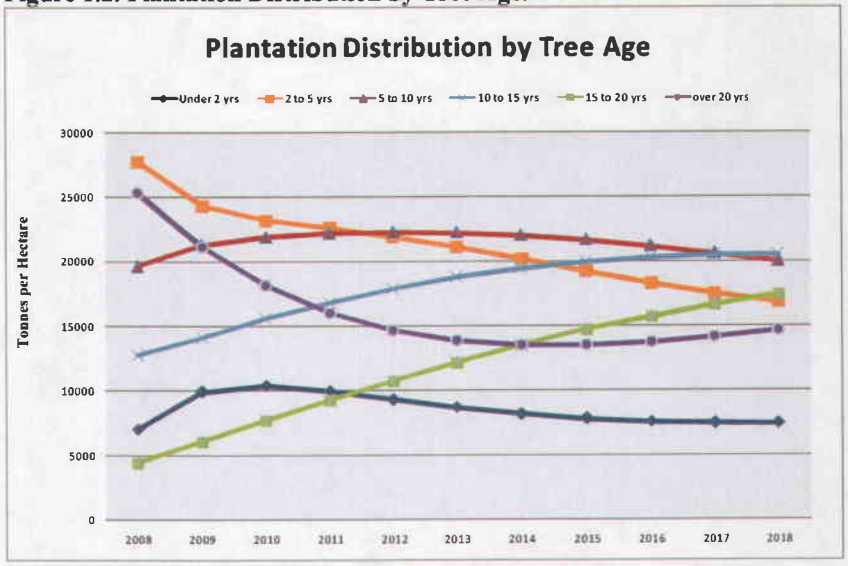
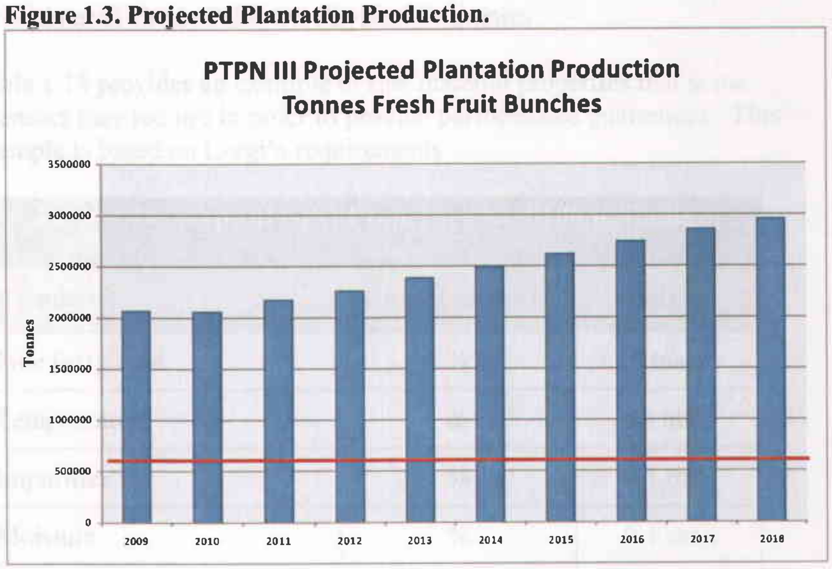
Figure 1.2. Plantation Distribution by Tree Age.



The end result of the retirement of trees older than 25 years and replacement by seedlings is to alter the tree age distribution over time, reducing the proportion of very young trees (under 2 years) and very mature trees (over 20 years) and increasing the proportion of the mid-range age groups. By the year 2018, the plantation will feature a much more evenly distributed set of age groups that will in turn provide a more evenly distributed yield from the entire plantation.

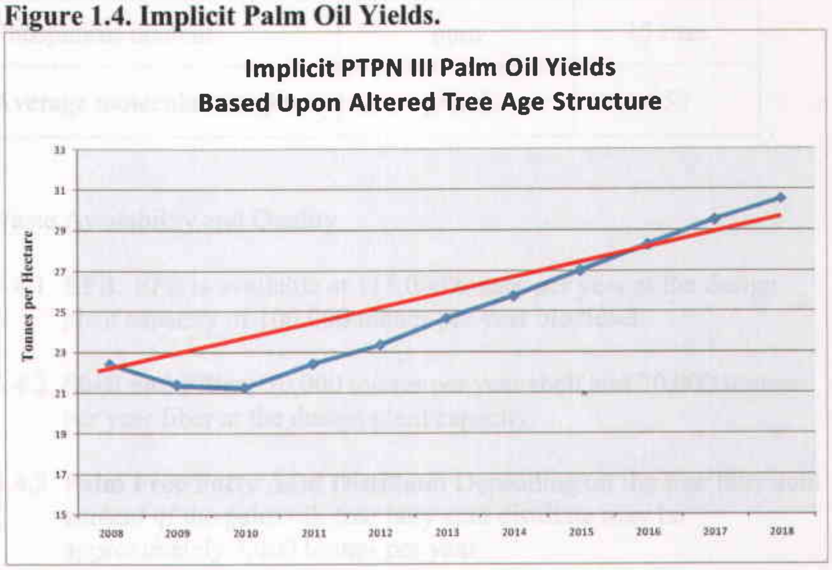
h) Total production from the plantation will increase over time due to increased yields from the altered age structure and improved genetics. Total production will hover around just over 2 million tonnes for the years 2008 through 2010, then increase each succeeding year by a little over 100,000 tonnes per year.

Figure 1.3. Projected Plantation Production.



i) The following chart illustrates implicit plantation-wide yields based upon the suggested tree replacement regimen outlined above. The red line illustrates the trend yield projection based upon historical yields. Interestingly, the implicit yields are slightly lower than the trend in the near future but surpass the trend in the later years, demonstrating the advantage of altering the tree age structure.

Figure 1.4. Implicit Palm Oil Yields.



TASK 1: PRELIMINARY REVIEW

1.4 FEASIBILITY STUDY SEMINAR

1.4.1 The Feasibility Study Seminar was prepared and presented to the PTPN-III Board of Directors and management on 11th March 2008 by Thomas Minnich and Michael Gootman of Prime Engineering, Inc. and Johannes Kario of PT Tracon Industri.

1.4.2 A hardcopy of the seminar presentation is included in Appendix A of this report.

TASK 2: TECHNICAL ANALYSIS

SECTION 2 – TECHNICAL ANALYSIS (TASK 2)

2.1 PALM OIL FEEDSTOCK DATA EVALUATION

2.1.1 Plant Design Requirements

2.1.1.1 The plant basis of design is a final biodiesel production output of 100,000 MT/yr.

- A majority of the biodiesel product volume is comprised of fatty acid-free palm oil, which gets converted to methylester (biodiesel) through the conventional palm oil-to-methylester process .
- The FAME, Fatty Acid Methyl Esther, removed from the palm oil gets processed in another area called the transesterification section. Here, FAME reacts with triglyceride, diglyceride, or monoglyceride with methanol (alcohol) which converts it to methylester (biodiesel) also.
- The final product volume of 100,000 MT/yr includes methylester from both processes, with more than 95% of biodiesel being from the conventional palm oil-to-methylester process.

2.1.1.2 Feedstock will be Crude Palm Oil (CPO) supplied by existing palm plantation and the combination of an existing and new CPO mill facility.

2.1.1.3 The plant and new CPO mill will be located adjacent to the existing CPO mill facility on property owned by PTPN-III.

2.1.1.4 The plant will generate 9.8 MW to 11.5 MW of power from biodiesel production waste depending on the technology employed. 7.95 MW will be exported to the PLN power grid.

2.1.2 Sustainable Plant Capacity

2.1.2.1 Based on the 100,000 MT/yr biodiesel requirement, the table below shows the requirements for a sustainable plant

TASK 2: TECHNICAL ANALYSIS

Table 2.1: Sustainable Plant Requirements			
Product	**Source**	**Percent Yield**	**MT per Year***
FFB	Plantation	100	481,000
CPO	Processed from FFB	22	105,800
RBD Palm Oil	Processed from CPO	95	100,500
Biodiesel	Processed from RBD	99.5	100,000*

*MT per year calculated based on requirement for 100,000 MT of biodiesel

2.2 PALM OIL WASTE FEEDSTOCK DATA EVALUATION

2.2.1 Waste Characteristics

2.2.1.1 Based on values provided by published data, the table below shows estimated fuel values for waste feed stock

Table 2.2: Fuel Values			
Source	**EFB**	**Shell**	**Fiber**
	MJ/kg	**MJ/kg**	**MJ/kg**
Case Study [1]	15.50	16.90	15.70
Case Study [2]	19.30	18.42	11.20
Case Study [3]	18.80	20.09	19.06
Prime Engineering	19.30	18.40	11.20
TRACON	15.50	-	-
Average	17.68	18.45	14.29

[1] "A Thermal Processing Plant in Thailand: A Case Study of Oil Palm Residues". Hochschule Bremen University of Applied Sciences, 2005. http://wwwserver.hs-bremen.de/BIWARE/Download/Workshop/technicall%20eng%20pdf/13.%20KMUTT_case%20study%20Biomass%20combustion%20Thailand_palm%20oil. (accessed July, 2008).
[2] Costa, R. and E. Lora. "The Energy Balance In The Production Of Palm Oil Biodiesel - Two Case Studies: Brazil And Colombia". Federal University of Itajubá, 2006. http://www.svebio.se/attachments/33/295.pdf. (accessed July, 2008).
[3] Chai, Au Leck. "Growth and Global Opportunites in Biofuels for Malaysian Palm Oil". *Malaysia International Biofuel Conference. 5-6 July, 2007.* PWTC Kuala Lumpur.

TASK 2: TECHNICAL ANALYSIS

2.2.2 Volume Available

2.2.2.1 Approximately 78% of the total FFB yield will become biomass. Based on a harvesting rate of 481,000 MT per year of FFB, the estimated yield of biomass is 375,000 MT per year. The amount of EFB, shell, and fiber from the biomass yield is estimated to be 53%, or 200,000 MT per year.

Table 2.3: Biomass Composition based on 500,000 MT/y FFB

Component	Amount (MT/y)	Percent Yield
EFB	115,000	30
Fiber	70,000	18
Shell	30,000	7
Palm Kernel and Cake	175,000	45
Total	390,000*	100%

* MT per year calculated based on overall estimate of 500,000 MT per year of FFB.

2.2.2.2 200,000 MT per year (EFB, shell, and fiber) is approximately 27.2 MT per hour (350 working days per year, 20 hours per day, and 95% onstream time).

2.2.2.3 55.8 MT per hour of total biomass generated from the CPO mill will be volume available for energy production. From this biomass combination of palm kernels, palm kernel cake, EFB, shell, and fiber, the boiler will generate 91,666 kg/h of high-pressure steam at 20 bar(g) and 220°C. Table 2.4 states the biomass distribution prior to steam production.

Table 2.4: Biomass-to-Energy Distribution Amounts

Component	Biomass Destination	Amount (MT/h)	Moisture Content (%)
Biomass from CPO Mill	EFB Crusher	55.8	65
Shredded Biomass	Screw Press	54.1	62
Dried Biomass	Furnace/Boiler	44.9	45-50
Oily Waste	Waste	10.9	100

TASK 2: TECHNICAL ANALYSIS

2.2.2.4 Further details on the biomass process flow can be found on the Energy Production Process Flow Diagram, drawing number G-004.

2.2.3 Potential Sustainable Energy Production

2.2.3.1 CPO Mill Incremental Power Consumption

PTPN-III is expanding the existing 30 MT/h CPO mill to 75 MT/h to accommodate the future biodiesel refining capacity. PTPN-III reports a power consumption of 17 kW per MT/h of CPO; therefore, the incremental power consumption is (75 -30 MT/h) * (17 kW/MT/h) = 765 kW.

2.2.3.2 Biodiesel Refinery and OSBL Power Consumption

Baseline power consumption according to Greenline Industries 100,000 tonne/yr biodiesel plant is 6,120,580 kWh per year for the processor unit and immediate OSBL equipment and facilities (buildings, site power, storage and loading systems). Assuming 6650 operating hours per year and 85% efficiency, the instantaneous power consumption is approximately 1,085 kW.

2.2.3.3 Biomass Waste-to-Energy Power Production

The most conservative power production case is a back pressure turbine (refer to Table 2.9) generating 9.8 MW net power after low pressure steam extraction for internal plant use. The sustainable power balance, as indicated in Table 2.5, is this 7.95 MW available for grid export.

Table 2.5: Sustainable Power Balance

	Power Produced (MW)	Power Consumed (MW)	Excess Power (MW)
Biomass	9.8		
CPO Mill		(0.765)	
Biodiesel and OSBL		(1.085)	
Export			**7.95**

TASK 2: TECHNICAL ANALYSIS

2.3 PLANT DESIGN

2.3.1 Palm Oil Collection and Processing

2.3.1.1 The existing facility has a CPO processing capacity of 3.5 million kg per year based on 2007 annual production. This equates to approximately 30 tonnes/hour processing capacity.

2.3.1.2 Based on the required biodiesel production rate and associated yields, a CPO supply rate of 75 tonnes/hour is required to maintain desired biodiesel production rates.

2.3.1.3 A new CPO processing mill is planned to be constructed adjacent to the existing mill. The new mill has a design production rate of 45 tonnes/hour.

2.3.1.4 Both the existing and new CPO processing mills will utilize mechanical methods to extract the CPO from the fresh fruit.

2.3.2 Reactor

2.3.2.1 In order to achieve a more complete reaction in a reasonable residence time, the plant has been designed to include two continuously stirred tank reactors in series.

2.3.2.2 The initial reaction occurs in Reactor A, which mixes the dry CPO, methanol, and catalyst. After sufficient residence time, the mixture is fed to Separator A. Separator A draws away glycerin from the stream at 50%. The remaining makeup of the stream is FFA, methanol, sodium methoxide, and water.

2.3.2.3 The main stream is then conveyed to Reactor B, where additional methanol and catalyst are added. This stream is then transferred to Separator B, where the glycerin mixture is removed again.

2.3.2.4 After completing two passes through reactors and separators, the stream is mainly methylester with some remaining methanol.

2.3.3 Storage

2.3.3.1 OSBL at Sei Mangkie

Storage for feedstock and finished product has been sized to store a 10-day supply of raw and finished products. The table below shows recommended storage capacities and estimated tank sizes.

TASK 2: TECHNICAL ANALYSIS

Table 2.6: Sei Mangkie Storage			
Product	**Total Storage**	**Number of Tanks**	**Tank Size (dia. x height)**
CPO	3,500 m^3	2	16m x 10m
Methanol	450 m^3	1	10m x 7m
Glycerin	350 m^3	1	10m x 7m
Biodiesel	9,900 m^3	3	22m x 12m
Off-spec Bio	100 m^3	1	7m x 5m

2.3.3.2 Terminal Site at Kuala Tanjung

The net output from the Sei Mangkie facility is 330 m^3 per day. The Terminal site in Kuala Tanjung is programmed for a 28 day barge delivery frequency. The barge characteristics assumed are based on the information below:

Barge Classification	= Reliance 550 Articulated Tug-Barge
LOA	= 156 m
Beam	= 24 m
Draft	= 8.4 m
DWT	= 19,700
Net Capacity	= 24,600 m^3 at 95%

The assumed Dead Weight Tonnage (DWT) is larger than the 3000 DWT barge indicated in Section 1 of the report as suggested by PTPN-III; however, it is recommended to program the tank and dock facility around a larger vessel that may arrive partially loaded with other cargos in other compartments. The assumed barge consists of 12 compartment tanks at 2000 m^3 each, and PTPN-III may realize economies by sharing loads. In this case, PTPN-III would use five compartments every 28 days.

Terminal site tankage will consist of two 7,500 m^3 API 650 fixed roof storage tanks (26m diameter x 15m height, each). The basis of the volume is 28 days of storage plus a 14-day buffer to account for barge delays or truck delivery interruption. The Conceptual Site Plan (Drawing No. G-006) in the appendix indicates the conceptual terminal layout.

TASK 2: TECHNICAL ANALYSIS

2.3.4 Transportation

2.3.4.1 Based on a production rate of 330 m^3 of biodiesel per day and an average tanker volume of 33 m^3, approximately 10 to 20 truck trips per day will be required to transport the biodiesel to port.

2.3.4.2 Based on 10 to 20 truck trips per day, the facility has been programmed for two truck loading racks.

2.3.4.3 The Kuala Tanjung Harbour will be the main destination for the biodiesel. The port is a two-hour round-trip drive (approximately 100 km).

2.3.4.4 The Kuala Tanjung terminal dock program is based on the following factors:

- Dock Structure: Timber pile access platform with vehicle access, piperack for two biodiesel lines and fire protection water lines, and power conduit.
- Loading System: articulated loading arms
- Unloading System: two-lane truck unloading rack (located adjacent to the two storage tanks, not on the dock).
- Dockhouse: Small enclosed structure for bill of lading processing and communication to the tank farm
- Mooring System: Two timber pile concrete capped breasting dolphins located at the main dock structure and two timber pile concrete capped mooring dolphins located approximately 100m from the dock centerline.
- Dredging: Minor dredging and spoils dewatering to accommodate the 8.4m barge draft.

The dock program is only assumed at this time as a general order of magnitude as the Feasibility Study scope of work did not include a detailed dock planning task.

2.3.5 Methanol Requirements

2.3.5.1 Based on a dry CPO feed rate, approximately 3265 kg/hr of methanol is added to the reactor. This constitutes about 22% methanol by weight.

2.3.5.2 Half of the methanol fed to the reactors is recovered as unpurified methanol that can be processed and returned to the methanol process supply stream.

TASK 2: TECHNICAL ANALYSIS

2.3.5.3 Approximately 1361 kg/hr of reusable methanol is recovered from the process and returned to the methanol storage tank.

2.3.5.4 The net methanol usage for the facility is estimated to be 2264 kg/hr.

2.3.6 Utilities

2.3.6.1 Cooling water is utilized in the methylester refining and methanol recovery processes.

Normal Flow:	1000 L/min
Supply Temperature:	23°C
Return Temperature:	43°C

2.3.6.2 Saturated steam, supplied from the biomass boiler, is utilized to introduce heat into several stages of the refining and recovery process.

Normal Flow:	33500 kg/h
Supply Temperature:	139 °C
Supply Pressure:	2.5 bar

2.3.6.3 On-site power distribution from the turbine/generator set to the CPO mill, biodiesel processor unit, buildings, site power, and OSBL equipment will be accomplished by stepping up the 480V power from the generator to 4760V. 480V step-down transformers will be located at the process equipment areas and 240V transformers at buildings and site power areas.

Normal Power:	1.85 MW
Transformer:	2350 kVA 480V to 4760V
Frequency:	50 Hz, 3 phase

2.3.7 Betacarotene Manufacture

Prime Engineering conducted a survey conference call with Mr. Leong, President of Carotech Inc. Carotech has developed a unique biodiesel methylester process technology that also separates betacarotene co-product from the methylester stream. Crude palm oil contains approximately 500 ppm betacarotene and residual amounts contribute to extended shelf-life of the biodiesel product.

However, producers with the appropriate commercial opportunity can still produce EN14214 spec biodiesel while also producing a co-product of 30% grade betacarotene, which can be sold for US$200-250/kg. Carotech will not quote yield information without a signed non-disclosure agreement with PTPN-III, but an estimate of the value proposition to PTPN-III is as follows:

TASK 2: TECHNICAL ANALYSIS

Betacarotene composition in CPO	= 500 ppm
CPO processing rate	= 105,800 tonne/year
Estimated Betacarotene yield	= 50%
Approximate Betcarotene production	= 26.5 tonne/year
Approximate Revenue potential	= US$5.3-6.6 million

Carotech does not offer the technology via license agreements and will only co-develop projects as a joint owner. They currently operate two plants in Malaysia for a combined production of 150,000 tonnes per year with sales to blenders and brokers in Japan, Indonesia, and the U.S.

2.3.8 Multi Feedstock Capability

Other vegetable oil and its derivatives can, essentially, be used as feedstock for Bio-diesel production. However, the following constrains are to be taken into consideration:

- Capacity to provide feedstock is one of the key success factors for the business. All vegetable oil, as well as its derivatives, can be used as feedstock, such as: palm oil, coconut oil, palm kernel oil, rapeseed oil, soybean oil, etc.

- Alternative feedstock: Waste Palm Oil, coconut oil, jatropha oil, and used cooking oil

- In Indonesia, until recently the only abundant feedstock available in the market is palm oil

- Feedstock selection mapping:
  - CPO Mill: CPO, Waste Palm Oil
  - Palm Oil Refinery: CPO, olein, stearin, PFAD
  - Coconut Oil Refinery: coconut oil, CFAD
  - Small Industry scale: Waste Palm Oil, PFAD, CFAD, used cooking oil, jatropha oil
  - Large Industry Scale: CPO

Process design of the biodiesel plant is to be based on chemical composition of the feed stock which generally contains the following:

- Glycerides
- Fatty Acid
- Gum (impurities)

TASK 2: TECHNICAL ANALYSIS

Each component is to be processed step by step as described below:

- Gum is separated through a de-gumming process
- Free Fatty Acid (FFA) is separated from the oil using fractionation and processed in the acid esterification unit
- Glycerides are processed in basic trans-esterification

The polishing process is similar for all types of feedstock and is in the form of washing and drying.

Basically, each feedstock will have different impurity contents. Some, like waste fats, which are animal fats derived as waste from meat processing, can be of high purity. Used frying oil is actually by definition a mixture of edible oils. Fats are extracted from the cooked meat or prefabricated food and blended with the so called used cooking and frying oils. During the frying or cooking process, a decomposition of fats occurs that increases the amount of free fatty acids in the used frying oil. Other impurities also arise in food processing in the form of solids, water, salts, and polymers.

The Biodiesel plant defined in this feasibility study has FFA content of 5% max in the feedstock. Other feedstock having FFA content higher than 5% can be used but needs to be pre-treated to remove the FFA and other impurities through enlarged de-gumming, FFA extraction, and bleaching sections. The collected FFA is then fed into the esterification unit, which would also need enlargement.

The cost impact on the additional pre-treatment and esterification unit is estimated to be USD 2 million.

2.4 COST-BENEFIT ANALYSIS

2.4.1 The total biomass generated by the CPO mill may be used as a fuel, a raw material for ethanol production, or both. In the case of both, the biomass would be used for the minimum steam and power requirements and the remainder for ethanol production. Note that the table below indicates only estimated revenue amounts, not profit margins. The margin for ethanol production is very low, whereas the margin for power sale to PLN is very high.

TASK 2: TECHNICAL ANALYSIS

Table 2.7: Cost Benefit Analysis

Waste Processing Technology	Estimated Capital Cost	Estimated Total Annual Revenue (Notes 1 and 2)	Relative Operating Costs
100% of biomass used for ethanol production	US$55 million	US$108 million	High
100% of biomass used for boiler fuel (based on Section 1.2.4) with 5 MW internal use, 4.5 MW sold to PLN	US$10 million	US$3 million	Low
POME biogas capture	US$5 million	US$900,000	Moderate

Note 1: Based on Chicago Board of Trade price of US$2.45 per gallon on 9 May 2008, FOB Indonesia.
Note 2: Approximate revenue costs are indicated and do not include conversion costs and costs of other raw materials. These are not income estimates.

2.5 WASTE-TO-ENERGY CONVERSION DESIGN

2.5.1 Biomass Preparation and Processing

2.5.1.1 Approximately 27.2 MT per hour of EFB, shell, and fiber is generated as direct waste product from the oil palm production in the CPO mill. This biomass residual product is manually loaded into trucks and transported to the biomass energy production plant, where it is unloaded into a feeding tray to a hopper. The hopper delivers the organic biomass into a shredding/crushing device, reducing the materials to a consistent size in order to have a uniform combustion reaction in the furnace.

2.5.1.2 The original biomass residuals contain 60% to 65% moisture content, which can lead to incomplete combustion. The process of shredding the material will partially aid in reducing moisture. However, a drying device must be implemented to reduce the moisture content to 50% or less before using it in the boiler. A screw press is recommended to remove excess moisture from the shredded biomass to prepare it for optimal burning.

2.5.2 Biomass Energy Conversion Equipment Description

2.5.2.1 A furnace and boiler packaged system will be used to produce steam for utilities within the biodiesel plant and generate power by utilizing a turbine and generator set. The packaged system consists of the following: metering bins, boiler (membrane wall furnace, two drum design), deaerator, boiler feed water pumps, emission control equipment (multi-cyclone collector and electrostatic precipitator), heat traps (air heater and economizer), stoker, instrumentation and controls, motor control centers, flues and ducts, stack, front ash hopper and ash conveyor, rotary seal valves, and ash screws under major discharge points for fly ash to convey to side of boiler.

2.5.2.2 The current process demands at the CPO mill require 500 kg of steam per metric ton of FFB. Therefore, 500,000 MT/yr FFB requires 28,500 kg/h steam. The process demands at the biodiesel refinery and methanol recovery plants require approximately 5,000 kg/h of steam. A total steam demand of 33,000 kg/h would be required for the plants to function.

Table 2.8: Approximate Plant Steam Demand

	CPO Mill	**Biodiesel Refinery and Methanol Recovery**
Steam demand (kg/h)	28,500	5,000
Total (kg/h)	**33,500**	

2.5.2.3 Approximately 45,000 kg/h of "pre-treated" biomass will fuel the feed furnace in order to generate 91,666 kg/h of high-pressure steam at 20 bar(g) and 220° C in the boiler. The high-pressure steam will flow through a condensing turbine where cooling water captures the latent heat of the saturated steam to improve power generation. The turbine will also have an extraction port to extract 33,500 kg/h of low-pressure steam at 2.5 bar(g) and 139° C, which will be delivered to the biodiesel plant for CPO drying, methylester drying, and methanol distillation.

2.5.2.4 The proposed turbine design from Elliot Company will operate at 5600 RPM with 33,500 kg/h uncontrolled low-pressure steam extraction and includes a

11 MW 50 Hz generator set complete with controls and synchronizing switchgear.

2.5.3 Transportation

2.5.3.1 The furnace will generate biomass ash at 4% of the initial biomass feed rate. Approximately 1,800 kg/h of ash will be produced at the boiler grating and will be utilized as potassium-rich fertilizer in the plantation fields. Two to three trucks will be loaded with the ash daily at the biomass energy plant and will then distribute the fertilizer evenly through the fields.

2.5.4 Storage

2.5.4.1 There will be no stockpiles of ash collection in the biomass energy plant.

2.5.4.2 The quantity of waste will vary with the season; therefore, the blended waste fuel of EFB, fiber, and shell will also vary. In the high-growth season, it is anticipated that up to 100% EFB will be burned. In the low-growth season, the EFB quantity will be supplemented with additional shell and fiber previously stored during the high growth season.

2.5.5 Furnace, Boiler, Turbogenerator Technology Assessment

2.5.5.1 The low melting point of the EFB ash can affect plant performance and can be caused by the eutectic mixture of silica and potassium in the ash. A complete combustion reaction can be achieved by maintaining sufficient air input to the furnace. Otherwise, the temperature in the combustion chamber will fall to a point where the EFB ash can solidify and form clinkers (solidified chunks of ash) over a period of time. Clinkers build up on the grate and can hinder further combustion, forcing the plant to shut down for regular maintenance. This affects the availability of the plant for power generation. Vibrating grates within the furnace can aid in the removal of clinkers and also remove spent ash.

2.5.5.2 The high alkaline content in EFB causes the ash to be 'sticky' by subliming at a temperature of 600°C, resulting in the substance attaching to boiler walls and superheater tubes. This can hinder heat transfer and affect plant efficiency. The negative effects of build up and slagging of fly ash within the furnace can be prevented with air injections which increase turbulence and residence time in order to obtain a complete combustion.

2.5.5.3 Stack gases are comprised of volatiles such as nitrogen, potassium, and chloride from the biomass. These gases containing chloride, will have a tendency to bind with the potassium in the ash to create KCl, which is corrosive and can condense on the superheater tubes. The formation of KCl should be suppressed in the furnace design by "starving" the biomass of oxygen during the period in which the most volatiles are released, which will prevent the binding of potassium to chloride. Another likely volatile produced by biomass combustion is HCl, which can be a harmful acid gas emission into the environment. Catalytic injection into the gas stream in the ductwork is a possible method to inactivate the exhaust, however, can be costly. By introducing Selective Non-Catalytic Reduction (SNCR); injections of urea or ammonia can reduce Nitrogen Oxide (NOx) emissions by up to 50%. The additional chloride content entrained in the gas can be removed by employing a simple scrubber on the stack. Additionally, sodium bicarbonate injections into the exhaust gas can convert harmful emissions into particulates, which can then be trapped by an electro-static precipitator or baghouses.

2.5.5.4 Three steam turbine/generator systems have been analyzed for the delivery of steam to the refining and recovery plants and generation of power. The first system is a steam turbine generator set with a condensing unit and controlled extraction port which generates an output of 10.5 MW at 50 Hz. The second system is comprised of a first stage back pressure turbine and a second stage condensing turbine with a total output of 9.8 MW at 50 Hz. The third system is a condensing turbine with a low pressure uncontrolled extraction, which produces an output of 11.5 MW at 50 Hz.

Table 2.9Available Steam Turbine Generator Systems

Systems	Power Output	Estimated Price
	MW	US$
Condensing Turbine with Controlled Extraction Port	10.5	$ 8,100,000.00
Back Pressure Turbine and Condensing Turbine Set	9.8	$ 4,812,000.00
Condensing Turbine with Uncontrolled Extraction Port	11.5	$ 6,000,000.00

2.5.5.5 It is recommended that a condensing steam turbine with uncontrolled extraction be utilized for the turbine generator set in this application as opposed to a traditional back-pressure turbine. Power output of the steam turbine is directly proportional to the pressure drop produced within the turbine. A condensing steam turbine creates a higher pressure drop than a back pressure turbine due to the production of condensed steam. In turn, this generates more power output than the back pressure turbine, making the condensing turbine more efficient in comparison. Back pressure turbines are also utilized to supply medium- to high-pressure steam to the process demands of mechanical plant equipment such as pumps, fans, and compressors. The proposed biodiesel and methanol recovery plants require only low-pressure steam for process heaters and reboilers; therefore, a low-pressure steam extraction port will be integrated into the condensing steam turbine. In the proposed energy production plant, 91,700 kg/h of high-pressure steam will expand below atmospheric pressure in the condensing turbine and then condense to water by transferring latent heat to the cooling water. A low-pressure steam extraction of 33,500 kg/h at 2.5 bar(g) and 139° C will be sent to the steam users at the plants. The resulting 58,200 kg/h steam will be condensed through the turbine generator set.

Table 2.10: Steam Turbine Characteristics

	Condensing Turbine	Back Pressure Turbine
Operating Pressure	Below atmospheric	At or above atmospheric
Efficiency	35% - 40%	15% - 35%
Pressure Drop	High	Low
Power Output	High	Low

2.5.6 Power Substation and Powerhouse

Available power export to PLN has been estimated at 7.95 MW normal instantaneous. The generator set produces three phase power at 480V and all of the 9.8 MW will be stepped up to 15kV. Power for internal consumption will be stepped down to 4760V and the remaining 7.95 MW will be exported to the grid. We are assuming that the grid connection will be to a PLN distribution line and not a transmission line. The 15kV susbstation will consist of three 4000kVA pad mounted oil cooled transformers.

A power backup system will be installed to enable the biodiesel plant to receive power from the PLN grid in the case of generator set failure or temporary outage. To accomplish this, a 15 kV power switchboard will be installed to close the circuit with the PLN feed and open the generator set circuit, enabling power to backfeed into the PTPN-III plant through the 15kV to 4760V main transformer. Drawing E-001 located in Appendix C demonstrates this one-line electrical circuit concept.

2.6 PRELIMINARY PROCUREMENT LIST

Table 2.11 indicates the preliminary equipment list for equipment in the CPO Mill Section (existing section at the Sei Mangke facility), Biodiesel Refinery Section, and Biomass Waste-to-Energy Section.

TASK 2: TECHNICAL ANALYSIS

Table 2.11: Equipment List	
Equipment	**Equipment**
CPO MILL SECTION	Methylester Heater
Belt Conveyor	Methylester Condenser
Bin Feeder	Biodiesel Drying Column
Screw Press	Vacuum Package
Degumming Tank	Neutralization Reactor
Mixer	Heat Exchanger
Supply Pump	Heat Exchanger
Filter - solids	Heat Recovery Exchanger
Filter - gums	Phase Separator
REFINING SECTION	Acidification Reactor
Oil Dryer Buffer Tank	Glycerin Pre-heater
Oil/Oil Heat Exchanger	Glycerin Reboiler
Acid Dosing Unit	Distillation Column
Acid Mixer	Oil Pre-heater
Acid Degumming Reactor	Oil Heater
Pneumatic Earth Feed	Oil Condenser
Bleaching Earth Dosing	Oil Vacuum Package
Cont. Heater-Bleacher	Flash Chamber
Oil/Water Separator	Gas-Liquid Separator
Bleaching Filter	Fatty Matter Purification
Stripper	Methanol Recovery System
Steam Generator	**BIOMASS SECTION**
Chimney	Biomass Boiler System
Daytank	Steam Turbine/Generator
First Loop Reactor	Hog Grinder
Second Loop Reactor	Screw Press
Third Reactor	Unloading Hopper
Flash Heater	POME Equipment
Methyelster Condenser	PLN Substation and Switchboard
Acid/Methylester Mixer	Plant Distribution Transformer
Separator	**GENERAL PROCESS, OSBL, & TERMINAL SECTION**
Methylester Holding Vessel	Loading Arms
Glycerin Holding Vessel	Loading Platforms
Methylester Heater	Pumps
Centrifugal Separator	Plate and Frame Heat Exchangers
Methylester Cooler	Selective Catalytic Reduction System
Methylester Pre-heater	Plant and Process Control System

TASK 3: ECONOMIC ANALYSIS

SECTION 3 – ECONOMIC ANALYSIS (TASK 3)

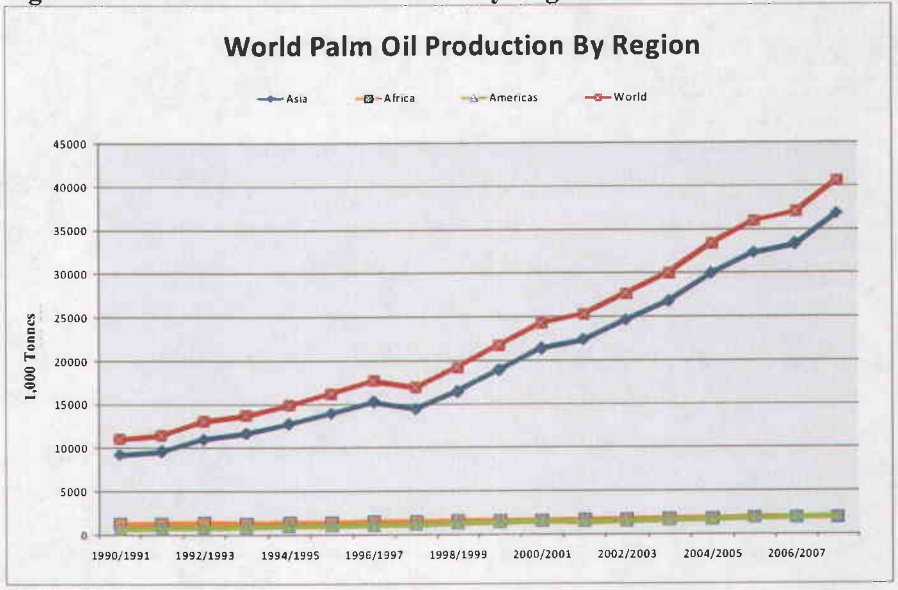
3.1 PALM OIL ANALYSIS

3.1.1 Palm Oil Availability

3.1.1.1 Palm Oil Production

Current total world palm oil production is estimated to be near 40.6 million metric tonnes. World palm oil production has increased at an average annual rate of just over 8% per year since 1991. Asian palm-oil-producing nations dominate world production, as shown in the following chart. Over 36 million tonnes of palm oil are produced in Asia, compared with only about 2 million tonnes produced in both Africa and the Americas.

Figure 3.1 World Palm Oil Production by Region.



Source: USDA, FAS

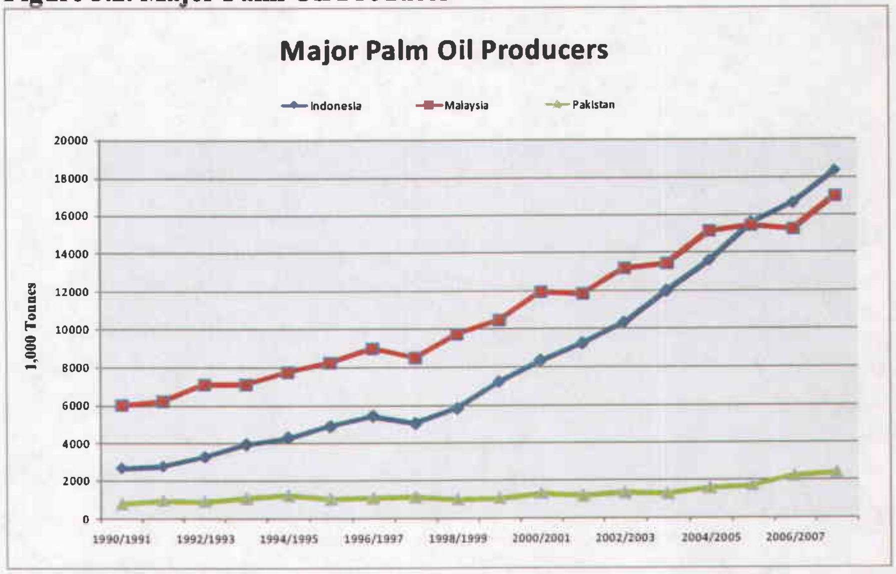
Three countries dominate both Asian and world palm oil production. Indonesia recently passed Malaysia as the largest producing country, with production of over 18 million tonnes per year. Malaysia produces around 17 million tonnes while Pakistan, the third-largest producer in the world, produces about 2.4 million tonnes.

TASK 3: ECONOMIC ANALYSIS

In Africa, Nigeria is the largest producer, with 2007 production near 800,000 tonnes. The second-largest African producer is Côte d'Ivoire, with production near 300,000 tonnes, followed by Cameroon and Congo, with production of about 180,000 tonnes per year.

The largest Americas producer is Colombia, with production of about 825,000 tonnes as of 2007. Costa Rica and Ecuador each produce about 300,000 tonnes, while Honduras and Guatemala produce under 200,000 tonnes each per year.

Figure 3.2. Major Palm Oil Produces



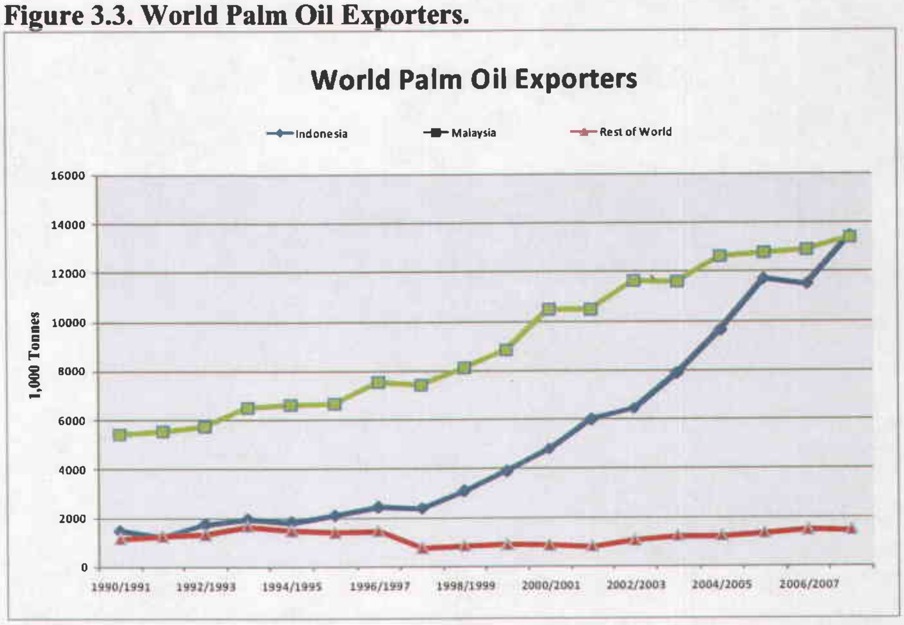
Source: USDA, FAS

3.1.1.2 World Palm Oil Exporters

World palm oil exporters are dominated by Indonesia and Malaysia, who account for about 92% of all palm oil export. Papua New Guinea is the third-largest exporter. Each nation exports about 13.4 million tones, but Indonesian exports are set to surpass Malaysian exports either this marketing year or next. The following chart illustrates world palm oil exports since 1990.

Task 3: Economic Analysis

Figure 3.3. World Palm Oil Exporters.



3.1.1.3 World Palm Oil Consumption

World palm oil use largely mirrors annual production. The following chart illustrates world palm oil total consumption, food use, industrial use, and end stocks. One should note that end stocks have remained nearly constant in recent years, indicating that consumption closely tracks production. The implication is that there is a market for the expanding production noted in Section 3.1.1.1.

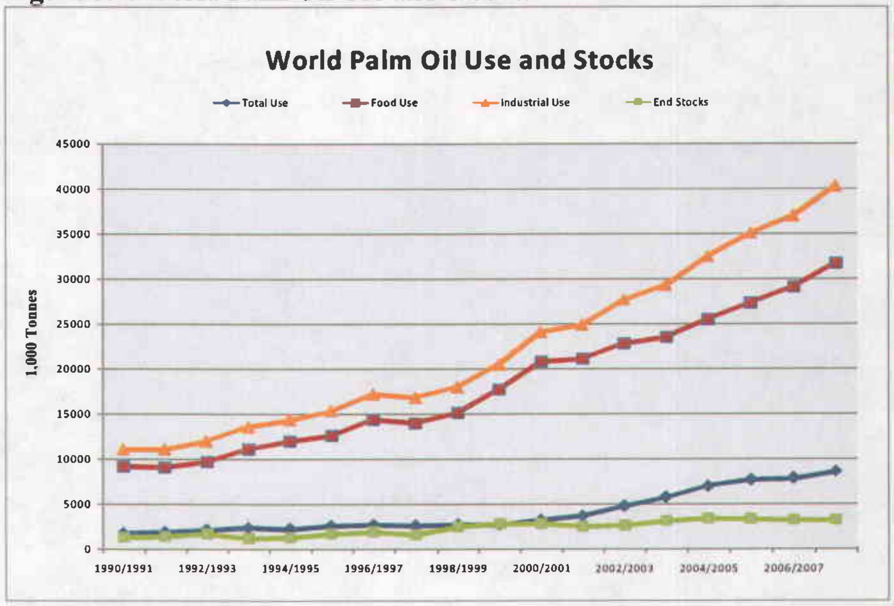
Food use of palm oil has shown strong growth, averaging 7.7% annual growth since 1991. Palm oil is typically used as a cooking oil and is also used in the food manufacturing industry. The fastest-growing market segment is in industrial use, where annual growth has averaged 9.7% since 1991 but has grown at over 15% per year since 2000. There are many industrial uses for palm oil including soap and detergent manufacture, candle making, cosmetics, lubricants, printing inks, and of course biodiesel production. Some industry sources are of the opinion that the recent growth in industrial use for palm oil is tied to increased biodiesel production in Asia and Europe.

Asian nations are not only the largest producers of palm oil, Asian nations are also the largest consumers of palm oil. Of the 40.3 million tonnes of palm oil consumed worldwide, 25.3 million tonnes are consumed in Asia.

TASK 3: ECONOMIC ANALYSIS

The single largest palm-oil-consuming nation is China, with a consumption rate of 5.7 million tonnes during the 2007/2008 marketing year.

Figure 3.4. World Palm Oil Use and Stocks.



Source: USDA, FAS

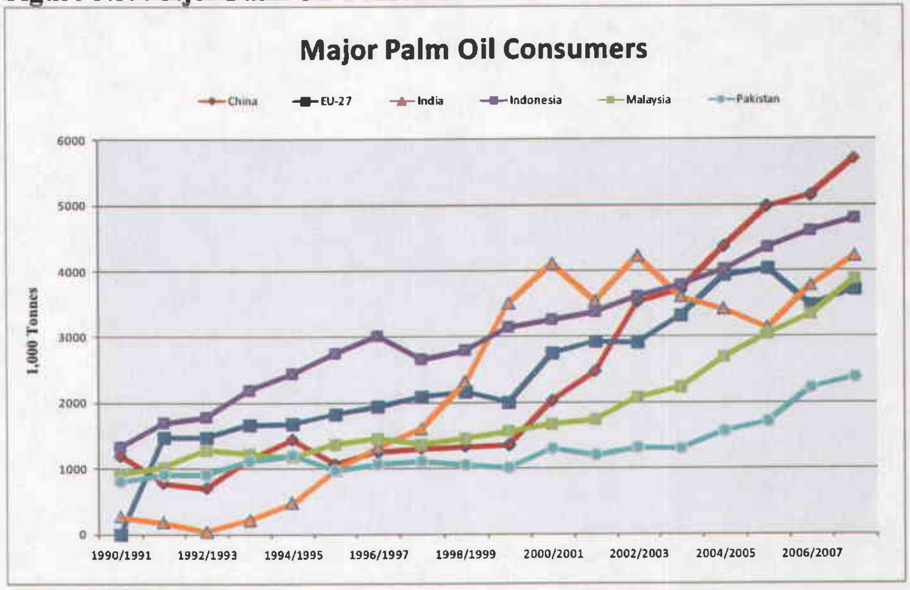
3.1.1.4 Major Palm Oil Consumers

As mentioned above, China is the world's leading palm oil consumer. The country uses about 5.7 million tonnes of palm oil during the 2007-2008 marketing year (USDA, Foreign Agricultural Service data). Indonesia, India, and Malaysia are the next three largest consuming nations while the EU-27 nations collectively take fifth place as major palm oil consumers. Pakistan rounds out the top group.

Not only is China the largest palm-oil-consuming nation, the growth in consumption in China is also noteworthy. Since the 1999/2000 marketing year, consumption has increased by more than 420%. This is largely due to China's emergence as a major economic factor in world markets as well as to a changing pattern of oil use. Prior to the 1999/2000 marketing year, all of China's palm oil consumption was for domestic food purposes. Since that point, however, palm oil has increasingly been used for industrial purposes. Industrial use has increased from essentially zero to 2.15 million tonnes since 1999/2000, representing nearly 60% of the increase in use over that time frame. Much of that consumption has been for various industrial uses, but some has also been used for biodiesel production.

TASK 3: ECONOMIC ANALYSIS

Figure 3.5. Major Palm Oil Consumers.



Source: USDA, FAS

3.1.1.5 Palm Oil Importers

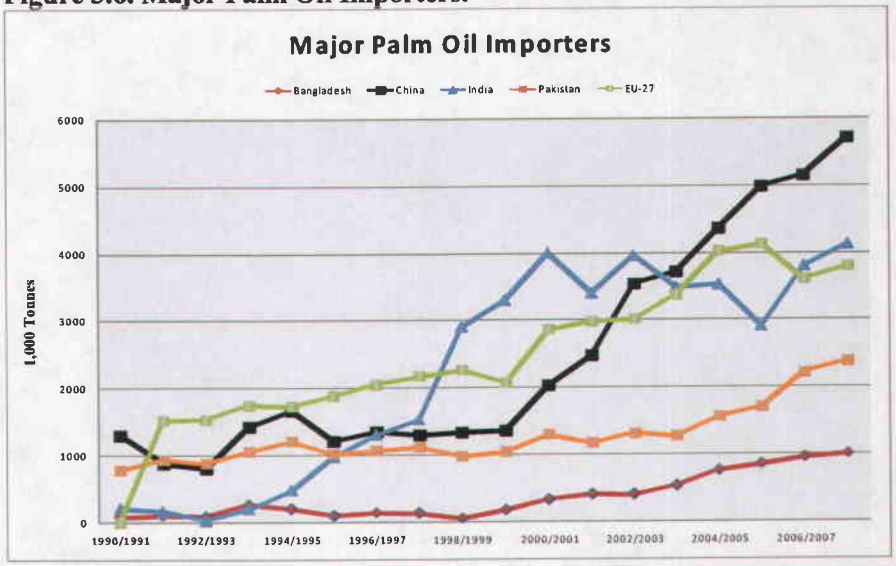
The four largest palm-oil-importing nations are in Asia: China, India, Pakistan, and Bangladesh. The EU-27, combined as a group, makes up the third-largest importing bloc. The following chart illustrates the trends in imports by these nations. Two points of interest should be noted. One, imports by China increased dramatically over the last 10 years, growing from about 1.3 million tonnes to about 5.7 million tonnes. Of the 4.6-million-tonne increase over that time period, about 2.3 million tonnes were for food consumption. The same amount was used for industrial purposes, growing steadily from 1999/2000.

Secondly, the volume of imports by India has leveled off over the last 10 years following rapid growth over the prior ten year period. India has embarked on a program of expanding domestic oilseed production to feed a growing population and provide supplies for various industrial uses including biodiesel production.

Pakistan and Bangladesh have demonstrated modest growth in imports, with most of the growth occurring during the last 10 years. EU-27 import growth appears to have leveled off during the last few years after a period of steady growth.

TASK 3: ECONOMIC ANALYSIS

Figure 3.6. Major Palm Oil Importers.



Source: USDA, FAS

3.1.1.6 Prospects for Expansion of Palm Oil Production

Palm oil production in Indonesia has increased an average of 10.6% per year since 1990 and by an average of 12% annually during the last 10 years. However, it will be difficult to maintain such growth rates for an extended period of time. While there likely will be continued expansion in palm plantations in Indonesia, developers face limits including:

- Available land suitable for palm cultivation
- The inherent need to diversify the Indonesian agricultural system to hedge against one-commodity reliance
- Environmental constraints such as air pollution problems from burning rain forests to expand palm plantations
- Wildlife diversity and habitat maintenance issues

Other issues pertinent to future expansion include economic, political, and social problems that may deter foreign investments in Indonesian palm oil production. Despite these potential problems, palm oil production will continue to expand, but at slower rates than seen over the last several years.

Growth in palm production in Malaysia has averaged 5.8% since 1990, but the rate of growth has slowed down over the last five years to an average of about 4.8% per year. About 13% of Malaysia's land area is currently in palm

TASK 3: ECONOMIC ANALYSIS

plantation production, representing about 4.2 million hectares as of 2006. According to an article published by the *International Herald Tribune* on September 7, 2006:

> *"Malaysia, the world's largest palm oil producer, says that it has almost run out of land suitable for new plantations of the crop, and that it will need to raise productivity of existing trees if it is to tap rising demand. "In terms of land that is suitable for palm, there's not much left," the minister for plantation industries and commodities, Peter Chin Fah Kui, said Tuesday. "As a result, our strategy is to increase the productivity and yield from whatever plantation land that we have now."*

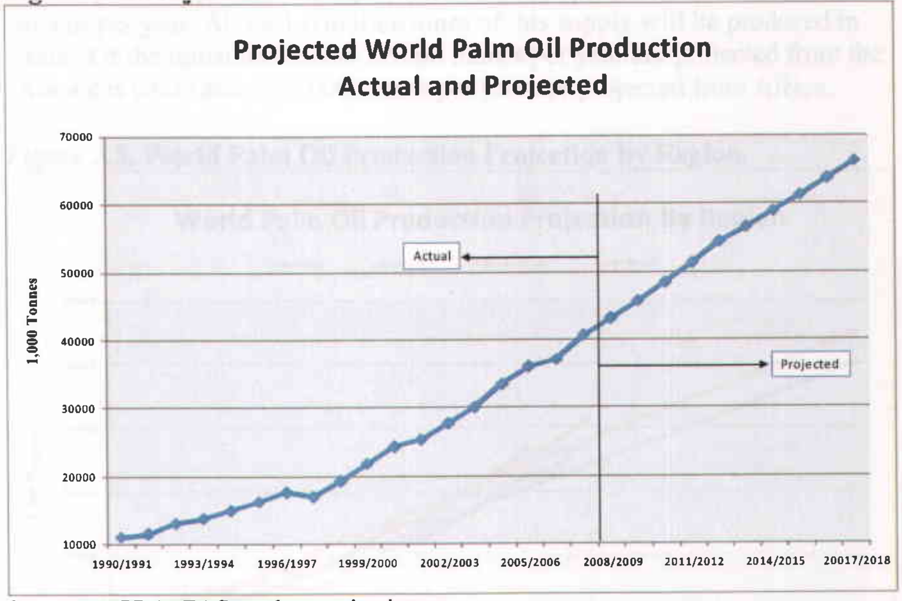
This adds credence to the assertion that growth in palm oil production will slow in the future unless major strides in yields are obtained. Indonesia will ultimately find similar limits of palm production expansion.
Pakistan, Colombia, and Nigeria will likely experience significant continued palm oil expansion. Other nations may well seek to expand palm production, but it will take time for them to make a significant impact upon world markets.

There will likely be continued improvements in genetic potential of trees planted in the future, allowing for increased yields. Improved plantation management should also contribute to improved yields. The end result is that despite the likelihood of a slowing of land being converted into palm plantations, production will still expand due to greater productivity per unit of land.

Projected future palm oil production is based on the assumption that world production will increase at an average annual rate of 6% from 2008 through 2013 and by an average annual rate of 4% from 2013 to 2018. Given that assumption, the following chart illustrates the projected world palm oil production for the next 10 years. World palm oil supplies could reach 66 million tonnes by crop year 2017/2018, a 63% increase over 2007/2008 crop year production.

TASK 3: ECONOMIC ANALYSIS

Figure 3.7. Projected World Palm Oil Production.



Source: USDA, FAS, author projections

3.1.1.7 Regional Palm Oil Production Projections

Historically, most of the world's palm oil has been produced in Asia and more specifically in Malaysia and Indonesia. Future production will most likely be centered primarily in those countries, as they have the proper land, labor, technology, climate, and desire to expand production. It is also likely that other nations will attempt to expand production of palm oil as the global demand for vegetable oils expands. Given the climate requirements of the palm tree, production is limited to those nations that already have at least some palm oil production. Thus, future expansion in palm oil will likely come from those nations.

The following chart illustrates a likely scenario of what future palm oil production will be and from where it will arise. The basic assumption is that a linear trend from the last several years of production is a reasonable predictor of future production. The trend lines developed based on the historical data are a good statistical fit and indicate that production has been increasing in a linear fashion since 1990. All indications are that future production will continue at nearly the same pace. As indicated in Figure 3.7, the pattern of growth may slow slightly due to various constraints but production will continue to expand.

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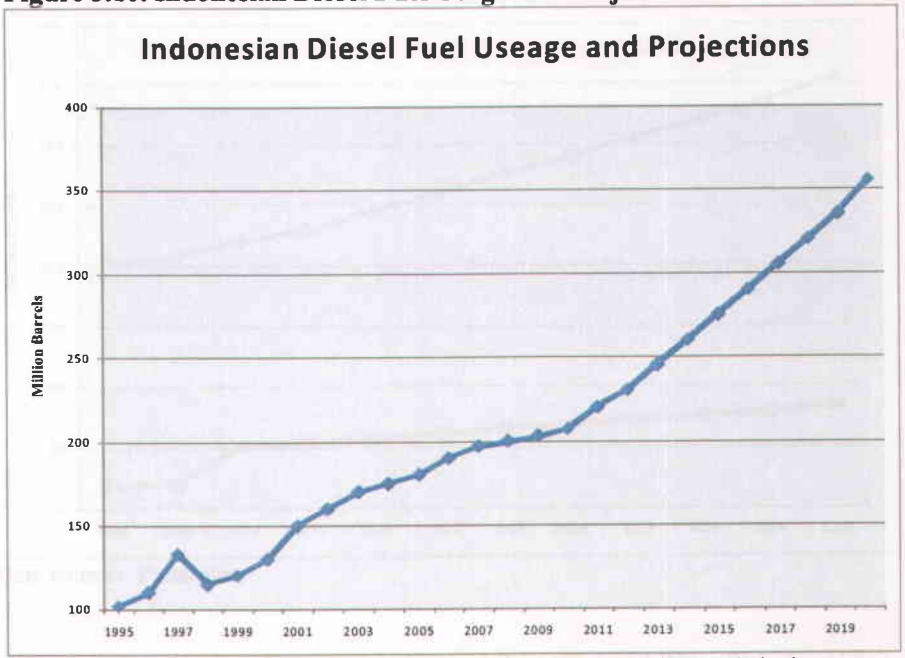
The following chart, taken from a paper titled "Prospect of DME Plant Development in Indonesia – as Substitute Diesel Fuel" by Husaiini and Yusep Kartiwa Caryana (presented at the 2nd Asian Petroleum Technology Symposium), shows historical and projected diesel fuel use in Indonesia. The authors base their projections on the assumptions that Indonesian economic development will average 5% through 2020 while population growth will average 1.25% and the number of vehicles will increase an average of 5% through 2020.

Figure 3.10. Indonesian Diesel Fuel Usage and Projections.



Data source: "Prospect of DME Plant Development in Indonesia – as Substitute Diesel Fuel" by Husaiini and Yusep Kartiwa Caryana

The total potential market for biodiesel could be the current market plus the projected use of diesel fuel, given that biodiesel can be produced at a cost competitive with petro-diesel.

More likely, the potential market for biodiesel will actually be less than the theoretical maximum. One estimate of market potential can be obtained from the policies for biofuels promulgated within Indonesia. Pertamina, the Indonesian state petroleum company, made a presentation titled "Expansion of Biofuels Retail Market in Indonesia" to a Tokyo conference in February

TASK 3: ECONOMIC ANALYSIS

being depleted in less than 20 years. Also, fuel was subsidized until last year by the government. With a worldwide increase in fuel prices and the end of the government fuel subsidy, retail prices for fuel sharply increased.

"Pertamina is the only seller of biofuels for transportation at the retail level, so announced plans to decrease the amount of biodiesel and ethanol used in its blends will have a direct impact on domestic consumption.

"Pertamina sell a mixture of 5 percent biodiesel with petroleum diesel in 210 petrol stations in Jakarta and 12 petrol stations in Surabaya. Due to the high price of the raw materials, such as CPO and methanol, Pertamina is reducing the biodiesel mixture to 2.5 percent."

(Source: *Bromokusumo Indonesia: Biofuels*)

3.1.2.2 Export Market Potential

If the thesis of the following articles is correct, then the export market will be critically important for Indonesian biodiesel producers:

"Fuel prices in Indonesia are subsidized, thus cheaper than international prices. When biofuel surges above crude oil prices, the government is unable to increase the subsidy," said Alhilal Hamdi, the head of the National Team for Biofuel Development.

"Producers are instead turning to exports, where they can sell their output at prices above those available in Indonesia's subsidized market."

About 80 percent of the country's biodiesel output would be exported, said Hamdi.

Surging production costs and low domestic biodiesel prices are being felt most by Indonesia's smaller biodiesel producers, who struggle to export and don't own palm oil plantations.

"Small producers have closed down their businesses. Big producers who buy raw material at a competitive price and export most of their products can survive," said Eka Bakti, director of PT

TASK 3: ECONOMIC ANALYSIS

Kreatif Energi Indonesia, a consultant firm for construction of biofuel refineries.

State oil firm Pertamina, which is retailing biodiesel made of 5 percent crude palm oil blended with 95 percent diesel oil, said its profit margin had shrunk since it began selling the green fuel in May 2006.

It buys raw material at 5,800 rupiah ($0.639) per liter, but sells biodiesel at gas stations at the same price as subsidized diesel oil of 4,300 rupiah per liter.

"We're still make profit, but profits from selling each liter of Biosolar is 85 rupiah lower than selling diesel oil," Hanung Budya, the company's deputy director of marketing said, referring to its biodiesel brand that is sold in 209 gas stations.

The government currently subsidizes biodiesel at the same level as fossil fuel, leaving Pertamina to cover the difference when biodiesel production costs exceed fossil fuel costs.

"We will expand it (biofuel production) if the government has a solution to Pertamina's shrinking profit," Hanung said.

Indonesia is expected to produce 750,000 tonnes of biodiesel this year, up from around 180,000 tonnes. Output is estimated to reach 1.2 million tonnes in 2008. ($1=9,072 rupiah)

Source: *Wulandari Indonesia Biodiesel Sector Faces Price Squeeze*

The above cited U.S. FAS GAIN report on Indonesia reports that most exports are to China and other Asian markets. Trade reports for 2007 indicate that exports to China are increasing and expectations are for that trend to continue. Malaysia sells primarily to Japan, so that is a potential market to explore. There are also sales to Europe and the United States. A March 13, 2007 article in *AsiaPulse* Magazine reports "PT Sumi Asih Oleo Chemical said it hopes to export 100,000 tons of biodiesel a year to the United States starting next month. Company President Alexius Darmadi said his company has signed a sales contract with a buyer in Houston, the United States," (Source: *Antara Indonesia's Sumi Asih to Export Biodiesel to U.S.*) Biodiesel sales to Europe are limited due to the fatty acid content of palm oil biodiesel and cold weather bulk storage.

annual demand growth of 16.7% being met by production growth of 27.6%. In 1999, the operating rate of domestic methanol assets was only 32.1% but increased to 70.2% by the end of 2007. It is likely that operations improvements to increase utilization lag slightly behind demand growth, requiring the need for imported methanol, which was 1127 kilotonnes (kT) in 2007.

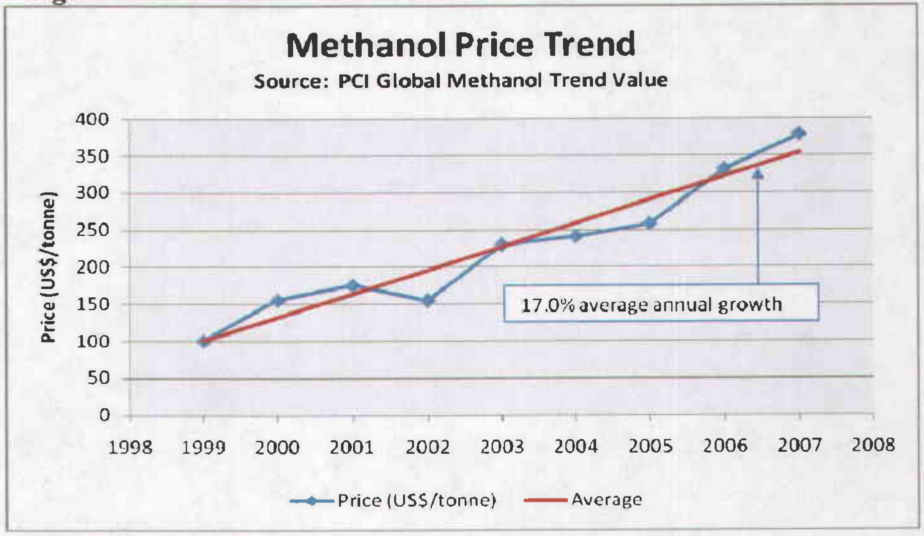
China imports approximately 600,000 tonnes of methanol from the Persian Gulf annually. This suggests that political instability could disrupt supply, thereby diverting methanol supplied from other Asian countries to China. Another possible threat to methanol supplies in East Asia is China's ability to continue increasing domestic supplies of methanol by either improving plant utilization, which is already at 70%, or constructing new facilities, which can take time.

North America is another potential threat to methanol supplies in Asia. Africa, Eastern Europe, and the Persian Gulf contribute approximately 600 kT/year to the United States' 7112 kT/year in methanol imports. This alone would not cause a supply shortage in Asia, but it may trigger a rebalancing of trade that could divert methanol supplies away from Asia if exports from these nations increase to the United States.

3.1.3.3 Methanol Pricing Trend

Methanol prices have grown substantially over the past eight years, with remarkable growth between 2005 and 2007. The spot price of methanol, Free On Board (FOB) Rotterdam, averaged US$379/tonne at the end of 2007. Figure 3.14 indicates the year-on-year growth in methanol prices and an average annual growth of 17%.

Figure 3.14. Methanol Price Trends.



TASK 3: ECONOMIC ANALYSIS

3.2 COST TO CONSTRUCT

Table 3.2a: Cost Estimate – Production Facilities

Item Description	Estimated Price (US$)	
Process Technology and Appurtenances	$ 7,500,000	
Spare Parts	$ 300,000	
Storage and Distribution Facilities	$ 10, 500,000	
Buildings	$ 2,000,000	
Kuala Tanjung Terminal Facility	$ 4,050,000	
Subtotal		$ 24,350,000
Contractor General Conditions (6%)	$ 1,461,000	
Contractor Overhead and Profit (15%)	$ 3,653,000	
Total Cost		$ 29,464,000
Contingency (25%)	$ 7,366,000	
Total Recommended Budget (Biodiesel Plant)		**$ 36,830,000**

TASK 3: ECONOMIC ANALYSIS

Table 3.2b: Preliminary Pricing on Biomass Waste-to-Energy Major Equipment		
Item Description	**Estimated Price (US$)**	
11.5 MW steam turbine/generator set with LP steam extraction and condensor	$ 6,000,000	
Furnace/boiler packaged system	$ 16,000,000	
Hog grinder (biomass shredder)	$ 500,000	
12,000 kVA 15kV substation and conductor	$ 700,000	
4760V main transformer	$ 120,000	
480V and 250V transformers	$ 180,000	
Backup switchboard	$ 480,000	
Subtotal		$ 23,980,000
Contractor General Conditions (6%)	$ 1,440,000	
Contractor Overhead and Profit (15%)	$ 3,600,000	
Total Cost		$ 29,020,000
Contingency (25%)	$ 7,255,000	
Total Recommended Budget (Biomass-to-Energy Plant)		**$ 36,275,000**

TASK 3: ECONOMIC ANALYSIS

3.3 OTHER CAPITAL COSTS

Table 3.3: Other Capital Costs	
Item Description	**Estimated Price (US$)**
Capital Improvements – first two years of operation	$ 1,000,000
Buildings	$ 2,000,000
Engineering at 8.4% of Construction Costs	$ 6,390,000
Commissioning and Startup	$ 3,000,050
Total Other Capital Costs (Entire Facility)	**$ 12,390,050**

3.4 BIODIESEL AND WASTE-TO-ENERGY ECONOMIC ANALYSIS

3.4.1 PT Pertamina (Persero) Purchase Agreement

The study has estimated full offtake of biodiesel product at 100,000 tonnes per year by PT Pertamina (Persero) based on recent increases in biofuels mandates from the government of Indonesia.

3.4.2 PLN Power Purchase Agreement

PTPN-III indicates it has received a preliminary Memorandum of Understanding (MOU) from PLN for the purchase of surplus power generated by the waste-to-energy power plant. The Power Purchase Agreement (PPA) terms are indicative of IDR 525 per kWh. PTPN-III has not been able to provide a copy of the MOU or other agreements at this time.

3.4.3 Other Purchasers

Other purchasers may include commodities brokers and traders in Singapore but have not been identified yet by PTPN-III.

TASK 3: ECONOMIC ANALYSIS

3.4.4 Country Risks

Since PTPN-III is 100% owned by the government of Indonesia, its risk can be closely correlated with Indonesia sovereign risk. According to a recent report by the International Monetary Fund (IMF) published in August 2006, Indonesia sovereign balance sheets are showing steady improvement since 2001 with default probabilities averaging between 1% and 2%.

The 14 February 2008 Fitch Ratings sovereign criteria report indicates the Republic of Indonesia country ceiling as BB+, long-term domestic currency credit at BB, and long-term foreign currency credit at BB. Outlook is indicated as Stable.

3.4.5 Taxes and Tax Holidays

Taxation values are included in the economic model and are derived from the Hill & Associates *The New Investor's Handbook for Indonesia*, 2004 edition. All Indonesian tax resident companies, defined as any domestic or foreign company incorporated or domiciled in Indonesia, is subject to the corporate tax rate of 30% for taxable incomes greater than IDR 100 million. Companies in good standing can, under the self-assessment principle, report income and calculate their own taxes once per month. In most cases, the monthly tax installment is calculated as one-twelfth of the difference between the prior year tax and prepayment taxes withheld. Companies reconcile their taxes annually according to Government of Indonesia tax code articles 23, 24, and 25. Taxable income recognizes deductions for normal business expenses including COGS and SG&A.

Assets are depreciated on a straight line or declining balance method in Indonesia. Each company is required to apply one method or the other consistently to all asset categories owned by the company. The economic model uses a 5% (20-year) straight-line depreciation for buildings and 7% (15-year) straight-line depreciation for machinery and equipment.

Import duties and Value Added Tax (VAT) guidelines are defined by the Government of Indonesia according to the following excerpt from the Indonesia Investment Coordinating Board (BKPM):

1. Import Duties

All investment projects of PMA as well as PMDN projects which are approved by the Investment Coordinating Board or by the Office of Investment in the respective districts, including existing PMA and PMDN companies expanding their projects to produce similar product(s) in excess of 30% of installed capacities or diversifying their products, will be granted the following facilities:

a. Relief from import duty so that the final tariffs become 5 %. In the case of tariffs of import duty which are mentioned in the Indonesian Customs Tariff Book. (BTBMI) being 5% or lower, the effective tariffs shall be those in BTBMI:

- On the importation of capital goods namely machinery, equipments, spare parts and auxiliary equipments for an import period of 2 (two) years, started from the date of stipulation of decisions on import duty relief.
- On the importation of goods and materials or raw materials regardless of their types and composition, which are used as materials or components to produce finished goods for the purpose of two years full production (accumulated production time).

b. Exemption from Transfer of Ownership Fee for ship registration deed / certificate made for the first time in Indonesia.

2. Tax Facilities

a. The government has introduced a Tax Bill No's 16, 17, 18, 19 and 20 of 2000 and applied since January 1, 2001. Based on this tax law, the domestic and foreign investors will be granted tax allowances in certain sector and/or area as follows :
- An Investment Tax Allowance in the form of taxable income reduction as much as 30 % of the realized investment spread in 6 (six) years.
- Accelerated depreciation and amortization.
- A Loss carried forward facility for period of no more than 10 (ten) years.
- A 10 % income tax on dividends, and possibly being lower if stipulated in the provisions of an existing particular tax treaty.

b. The government has also introduced provisions No's 146 of 2000 of 2000 and 12 of 2001 on the importation and/or delivery of Selected Taxable Goods, and or the provision of Selected Taxable Services as well as the importation and or delivery of Selected Strategic Goods which are exempted from Value Added Tax.

Tax holidays in Indonesia have been eliminated since the 2000 agreement with the International Monetary Authority. Biofuels developers in Indonesia have been petitioning the BKPM and Government of Indonesia to implement new tax incentives to replace the tax holidays, but a national policy is not currently available. The economic analysis assumes zero tax incentives.

3.4.6 Working Capital Requirements

Working capital, or the balance of the difference between total current assets and total current liabilities of a business unit, represents capital on hand to run a business. The working capital for the PTPN-III biodiesel and biomass-to-energy plant is estimated for the purpose of building the economic model and including the working capital required to start operations of the plant: i.e., purchasing raw materials and paying salaries and wages. The year-on-year change in working capital also influences the project's free cash flow and subsequent rate of return. The method used to estimate working capital requirements is based on an analysis of PTPN-III's annual report data from 2005 and determining the working capital as a percent of revenue. This is a normal method of estimating working capital, as cash, inventories, and receivables typical vary directly with revenue. The following table indicates the data used to determine the working capital.

Task 3: Economic Analysis

Working Capital Estimation (Based on 2005 PTPN-III Annual Report Analysis)		
Current Assets		
Cash and cash equivalents	IDR	330,449,476,303
Short term investment	IDR	178,162,768
Trade receivables	IDR	26,793,384,121
Other receivables	IDR	20,892,042,350
Inventories	IDR	138,716,278,623
Prepaid taxes	IDR	18,296,000,332
Other current assets	IDR	48,169,073,689
Total Current Assets		583,494,418,186
Current Liabilities		
Trade receivables - 3rd Parties	IDR	161,896,113,195
Taxes payable	IDR	70,536,527,763
Accrued expenses	IDR	192,505,481,795
Total Current Liabilities		424,938,122,753
Working Capital (IDR) = Current Assets - Current Liabilities	=	158,556,295,433
Working Capital as % of Revenue	=	**9.29%**

Assuming that the first-year revenue is US$85,635,000 (based on the sale of 100,000 tonnes in 2010 at a market price of US$1,230 per tonne and 48,000 MWh at US$0.062 per kWh), the working capital required at the commencement of plant operations is estimated at US$12,400,000. This value is added to the total capital cost of the project, as it will need to be included in the project budget and also raised in the form of PTPN-III capital contribution or a as part of the project finance loan.

3.4.7 Operating Requirements

Operating requirements are represented in the economic analysis by operating costs that have been estimated for the combined biodiesel and biomass-to-energy facility. Two cost categories were estimated to determine total operating costs:

TASK 3: ECONOMIC ANALYSIS

Category 1: Cost of Goods Sold (COGS)

COGS has been estimated as conversion costs and raw material costs per tonne of methylester produced, including costs to operate the biomass-to-energy plant. Conversion costs are estimated at US$17.85 per tonne based on previous study data obtained by Prime/Tracon for comparable biodiesel facilities in Indonesia. Raw material costs, estimated from data provided by technology suppliers, include methanol, methylate catalyst, and ion exchange resin at a total of US$89 per tonne. The cost of CPO raw material is zero in our base analysis, since PTPN-III will internally transfer CPO on a zero-cost basis. Table 3.3 summarizes COGS data.

Benchmark operating data, according to Vertical Asia Ltd., a biofuels trader in Singapore, has been estimated at US$0.49 per litre at the 2008 Asia Bulk Liquids Conference. Table 3.3 indicates this as benchmark data for comparison. The benchmark is equivalent to US$578.20 per tonne of biodiesel produced, accounting on average for many producers purchasing CPO raw material.

Table 3.4: Costs of Goods Sold

	US$/tonne	% of Revenue	US$/year at full production
Conversion	$ 17.85	1.4%	$ 1,893,800
Raw Materials	$ 89.00	7.1%	$ 9,442,200
TOTAL	**$ 106.85**	**8.5%**	**$ 11,336,000**
BENCHMARK	**$ 578.20**		

Category 2: Selling, General & Administrative (SG&A) and Other Expenses

SG&A and Other Expenses were estimated based on a five-year average of data from PTPN-III's crude palm oil business operation. The following table presents the data from our annual report analysis and the average SG&A and Other Expenses as a percent of CPO sales. Selling expense is estimated at 3% of sales, General & Administrative (G&A) at 23% of sales, and Other Expenses at 4% of sales. Technical, Engineering, and Maintenance costs are included in the G&A estimate. COGS was also estimated but not used in our economic analysis (see Category 1, above).

TASK 3: ECONOMIC ANALYSIS

Annual Report Analysis PTPN-III 2005 (currency indicated in millions)							
		2001	**2002**	**2003**	**2004**	**2005**	**Average**
Annual Volume							
CPO	tons	359751	419559	435321	484680	536543	447171
Total Palm Oil Sales	IDR	902,631	1,107,663	1,258,245	1,641,635	1,706,508	1,323,336
	US$	100	123	140	182	190	147
Costs							
Cost of Goods Sold	IDR	477,154	574,793	649,638	841,256	1,046,904	717,949
IDR per kton	IDR	1,326.35	1,369.99	1,492.32	1,735.69	1,951.20	1,605.54
US$ per kton	US$	0.15	0.15	0.17	0.19	0.22	0.18
as % of sales	%	53%	52%	52%	51%	61%	**54%**
Operational Expenses	IDR	227,663	274,614	391,300	383,415	366,605	328,719
Selling Expense	IDR	22,766	27,461	39,130	38,342	36,661	32,872
US$ per kton	US$	2,530	3,051	4,348	4,260	4,073	3,652
as % of sales	%	3%	2%	3%	2%	2%	**3%**
General & Admin Expense	IDR	204,897	247,153	352,170	345,074	329,945	295,847
US$ per kton	US$	22,766	27,461	39,130	38,342	36,661	32,872
as % of sales	%	23%	22%	28%	21%	19%	**23%**
Other Expenses	IDR	72,360	86,689	33,314	41,242	10,453	48,812
US$ per kton	US$	8,040	9,632	3,702	4,582	1,161	5,424
as % of sales	%	8%	8%	3%	3%	1%	**4%**

3.4.8 Governmental Provisions

According to a July 2008 Dow Jones report, the Government of Indonesia is in the process of implementing a new mandate for higher on-road biofuels use. The government is anticipating a new regulation starting in September 2008 that mandates a 2.5% biodiesel blend starting in October, increasing to a 10% blend (B10) by 2010.

3.4.10 Rates of Return

The threshold investment rate of return is derived from PTPN-III's corporate debt-to-equity structure and their costs of borrowed and invested capital. From the 2005 Annual Report, debt and equity are reported as follows:

Total Liabilities (Debt)	= IDR 1,347 billion
Total Equities	= IDR 1,067 billion
Debt-to-Equity Ratio	= 1.26

TASK 3: ECONOMIC ANALYSIS

Bonds Payable are IDR 320 billion of the Total Liabilities amount and average 13.5% as a payable rate of return. Employee benefits obligations are IDR 255 billion and pledge a 10% return on plan assets. The balance of noncurrent liabilities includes payables and long-term loans. Assuming that the majority is long-term loans, then the interest rate of the remaining noncurrent liabilities (IDR 204 billion) may be estimated at 16.5%, which is the highest reported variable interest rate paid on other PTPN-III long-term bank loans. The weighted average cost of debt is estimated at 13.1%.

Share capital makes up IDR 315 billion of the IDR 1,067 billion in total equities. A dividend payment was released to shareholders (Government of Indonesia) in 2005 of IDR 77.8 billion, equivalent to a 24.7% one-year annual return.

Applying a corporate tax rate of 25% credit on the cost of debt, PTPN-III's Weighted Average Cost of Capital (WACC) is as follows:

Estimated WACC (PTPN-III) = 16.4%

WACC is a blended cost of capital that represents the minimum rate of return that any new capital project should yield. WACC of 16.4% is used in the economic analysis, the results of which are presented in Section 4 of this report.

TASK 4: FINANCIAL ANALYSIS

SECTION 4 – FINANCIAL ANALYSIS (TASK 4)

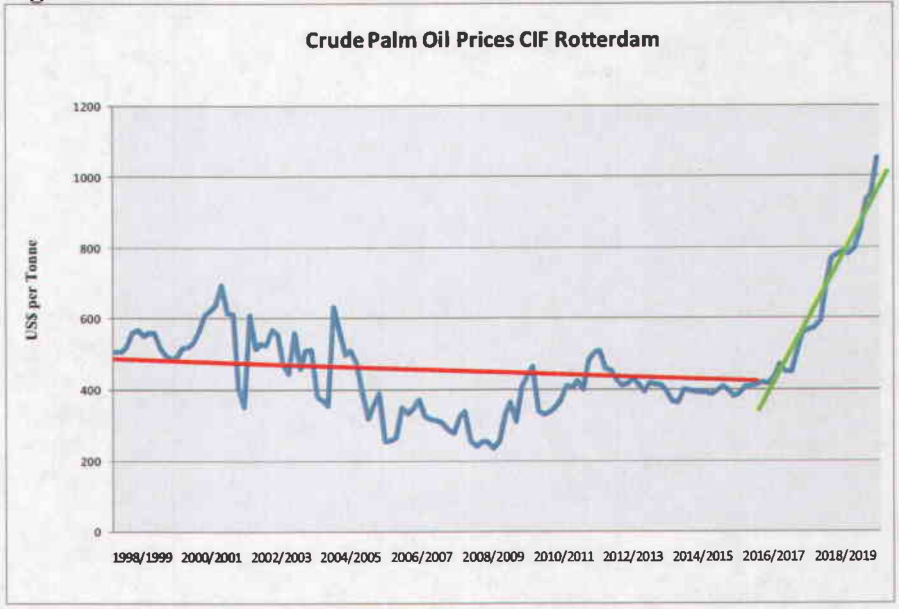
4.1 FINANCIAL MODEL

4.1.1 Feedstock Pricing Scenarios

4.1.1.1 Crude Palm Oil Prices

Two accurate and consistent crude palm oil price series were secured from the United States Department of Agriculture and the Jacobsen Company. The first price series is for monthly crude palm oil prices in U.S. tons, Customs/Insurance/Freight (CIF) Rotterdam from October 1996 through January 2008. The second price series is weekly data for crude palm oil CIF Gulf ports, U.S.A. This series covers the period February 2005 through February 2008. The following chart presents the data for the Rotterdam price series.

Figure 4.1. Crude Oil Prices CIF Rotterdam.



Source: United States Department of Agriculture

When studying the Rotterdam price series, one can observe two differing trends in the data. From the period of October 1996 through June 2006, crude palm oil prices for delivery to Europe actually trended lower, starting out near $500 per ton and irregularly moving down toward $200 per ton. Prices then found a trading range near the $400 per ton level that lasted for

TASK 4: FINANCIAL ANALYSIS

four years. In July 2006 until January 2008, crude palm oil prices have risen sharply from about $400 per ton to nearly $1,100 per ton. Many market observers believe that there has been a fundamental change in demand for vegetable oils and other energy-bearing crops that will result in a higher base price level likely to remain in place for the immediate future.

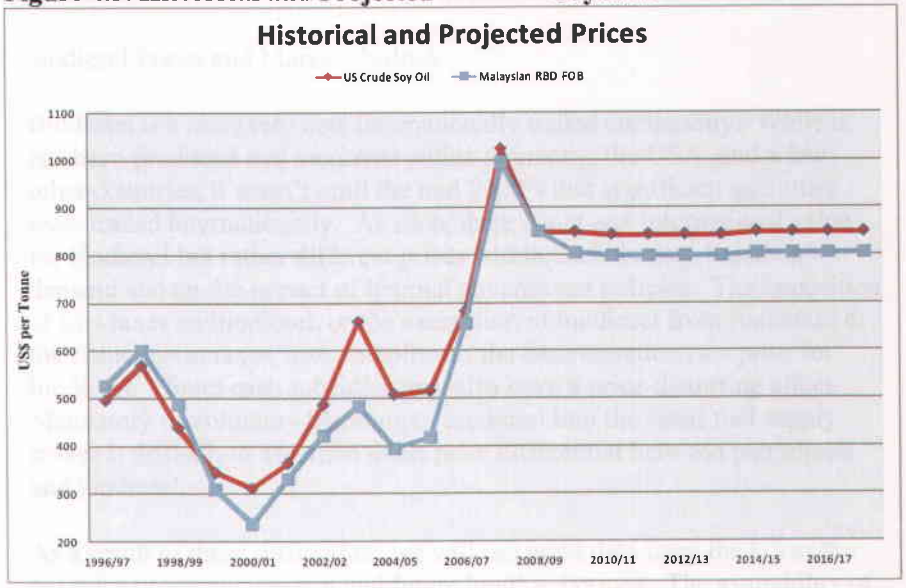
The primary reason for the sharp price rise beginning in the summer of 2006 has little to do with palm oil per se. More likely, the sharp rise in palm oil prices reflected the general price rise in all vegetable oils and other energy-bearing crops. Vegetable oil prices, and specifically soybean oil prices, started rising during the summer. Soybean oil represents about one-third of all vegetable oils produced globally and is a key market leader for all vegetable oils. It historically has been the market leader due to its importance in world trade and established market mechanisms. Palm oil is also a major global oilseed but tends to be a market follower rather than a market maker.

Market prices not only reflect the actual current supply and demand situation, but also reflect expectations about the future potential supply and demand balance. If expectations are for a future shortage, then the market raises the price to ration current supplies for use if the expected shortage does in fact occur. Thus, the cause of that rise can be tied to the expected shortage of corn that was reflected by a sharp rise in corn prices. The increase in demand for corn can be traced directly to its use in producing ethanol, particularly in the U.S. Historically there has been a strong direct relationship between corn prices and soybean prices and thus between corn prices and soybean oil prices. Global vegetable oil prices tend to move in tandem with one another, with soybean oil prices tending to lead the pack.

Palm oil prices were lifted not by an actual or expected change in palm oil supplies or demand, but rather by a change in the overall global vegetable oil supply and demand and impacts of crops competing for cropland. The high corn prices during the last half of 2006 led to a large shift in crop acreage away from soybeans and into corn, especially in the U.S. This in turn led to a shortage of soybeans and thus soybean oil, which fueled the rise in vegetable oil prices. As soybean prices rose, soybean oil correspondingly rose and other vegetable oils followed, as generally one vegetable oil can substitute for another in many uses. The following chart illustrates the close relationship between palm oil and soybeans.

TASK 4: FINANCIAL ANALYSIS

Figure 4.3. Historical and Projected Prices of Soybean and Palm Oils.

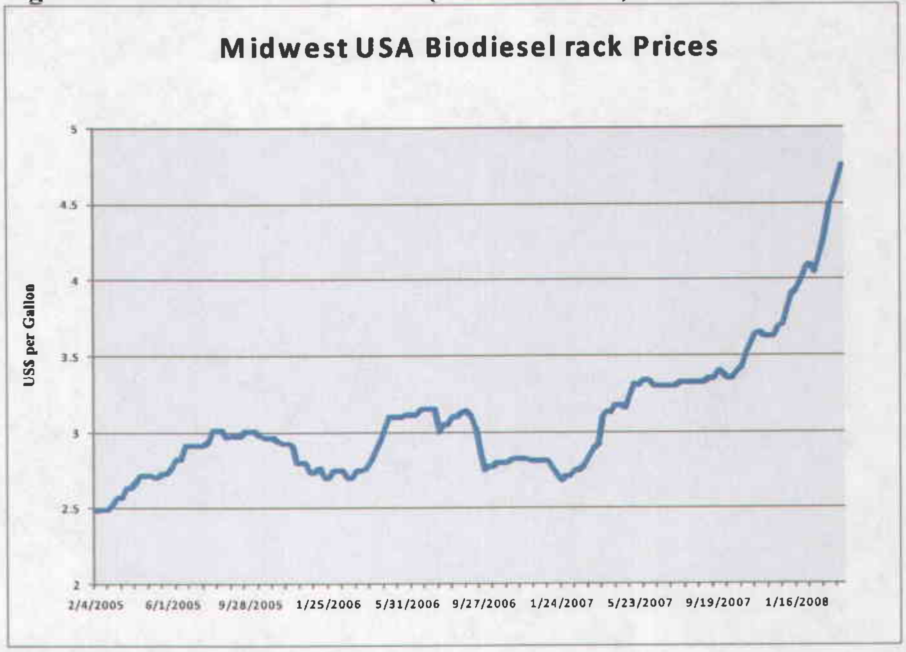


Based on USDA long-term projections, palm oil should trade at an average of around $800 per tonne over the next 10 years. That is not to say that prices will remain at or near $800 during that entire timeframe, but that prices are expected to average near that level. One way to estimate the amount of expected variation from that long-term average price is to bracket the "average price" with a measure of the historical variability of the price. The historical standard deviation of RBD palm oil prices at U.S. Gulf ports, measured monthly from 1995 through January 2008, was $147 per ton. If we both add and subtract the standard deviation from the "average price," we can develop a range within which prices are likely to spend about two-thirds time during normal trading.

For example, assuming palm oil to have a long-term average price of $800 and a standard deviation of $147, a range of $653 to $947 can be developed. Prices can be expected to trade within that range about two-thirds of the time. Nearly one-third of the time, prices would trade beyond those bounds. If we set a range of two standard deviations from the average, or $294, a range of $606 to $1094 can be further developed. Nearly 97% of the time, prices would trade within these bounds. In only 3% of cases would prices be expected to trade beyond those bounds.

TASK 4: FINANCIAL ANALYSIS

Figure 4.4. Rack Price of Biodiesel (Midwestern US).



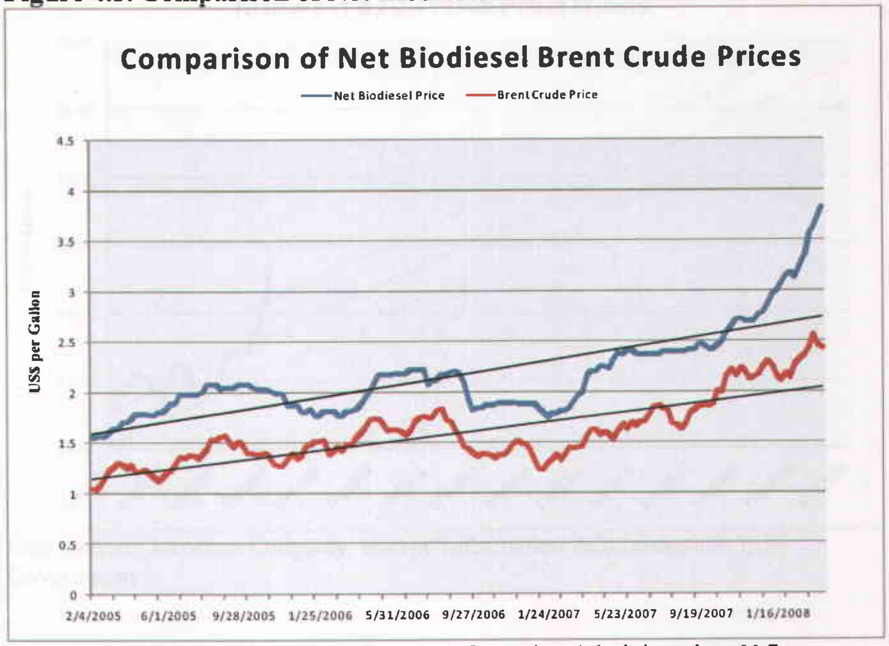
Data source: Jacobsen Company

Biodiesel prices spent most of 2005 and 2006 and into 2007 trading within a range from about $2.75 to $3.25 per gallon. Starting about June 2007, price rose sharply. By the end of March 2008, prices had reached $4.75 per gallon. In the previous section we discussed the surge in prices for grain and oilseed crops. These higher feedstock prices, along with sharply higher petroleum prices, are likely responsible for the increase in biodiesel prices.

It can be argued that the rack price is not the true value of biodiesel as a fuel since it incorporates the federal biofuels subsidy. The subsidy is paid to the blender of the fuel. Market observers believe most of the subsidy is passed back to the producer. The subsidy amount is $1.00 per gallon for biodiesel produced from virgin vegetable oils and $0.50 per gallon for biodiesel produced from feedstocks such as livestock fats and recycled vegetable oils. According to the National Biodiesel Board, about 85 percent of the biodiesel produced in the U.S. over the last few years originated from virgin soybean oil, with most of the remainder being produced from other feedstock sources. Using this estimate, we can then assume that the average subsidy paid would amount to about $0.925 cents per gallon. If we deduct this subsidy from the rack price, we can derive a "fuel value" for U.S. biodiesel or a price that would be paid absent any subsidy.

Biodiesel prices have a strong correlation to petroleum prices. Figure 4.5 combines the "net" biodiesel price (rack price minus estimated average subsidy) along with the price of Brent crude oil delivered to USA Gulf ports. Note that the Brent crude price is stated on a per-gallon basis for easy comparison.

Figure 4.5. Comparison of Net Biodiesel Brent Crude Prices.



Data source: Jacobsen Company, Energy Information Administration, U.S. Government

From March 4, 2005 until March 26, 2008, the price of biodiesel closely tracked the price of Brent crude oil delivered to US gulf ports. Note the slope coefficients of the two trend equations are very similar. On average, "net" biodiesel was valued at 1.4 times the price of Brent crude. There was some variation, ranging from 1.2 to 1.6 times Brent price. Since June 2007, the price relationship has averaged about 1.3. The point is that there is a strong relationship between the prices of these two commodities. Thus, the price of crude oil may be useful in predicting the price of biodiesel.

TASK 4: FINANCIAL ANALYSIS

prices. Ethanol prices recently have traded at about two-thirds the price of gasoline, almost exactly reflecting its energy value as a fuel.

According to the National Biodiesel Board, biodiesel has about 92% of the heating value of Number 2 diesel fuel. If we assume that heating value is a good measure of a fuel's ability to create horsepower, than we would expect biodiesel to have a market value of about 92% of Number 2 diesel fuel once production is at a level where biodiesel is priced strictly at its fuel value. The result is that the linear biodiesel price projection shown above may well overstate the future market value and that even if crude oil were to move toward \$5.00 per gallon, biodiesel prices may well be closer to \$5.00 per gallon than the \$6.50 level shown in the chart.

Downside price risk in biodiesel and crude oil may be limited by the ability of OPEC countries to manage crude oil supplies and thus influence prices. A recent news item from Worldenergy.net reads:

> *"Saudi Arabia's oil minister Ali al-Nuaimi says oil prices will stay above a minimum of \$60 to \$70 dollars per barrel because public policy in many countries is to invest in alternative energy sources to compete with petroleum, and this can only occur if oil is priced at this level. If you take all the subsidies that go into producing a barrel of biofuels," he said, "I doubt that anybody can make money in that business with a price of less than \$60 or \$70. Therefore, a line has been drawn below which the price cannot fall."*

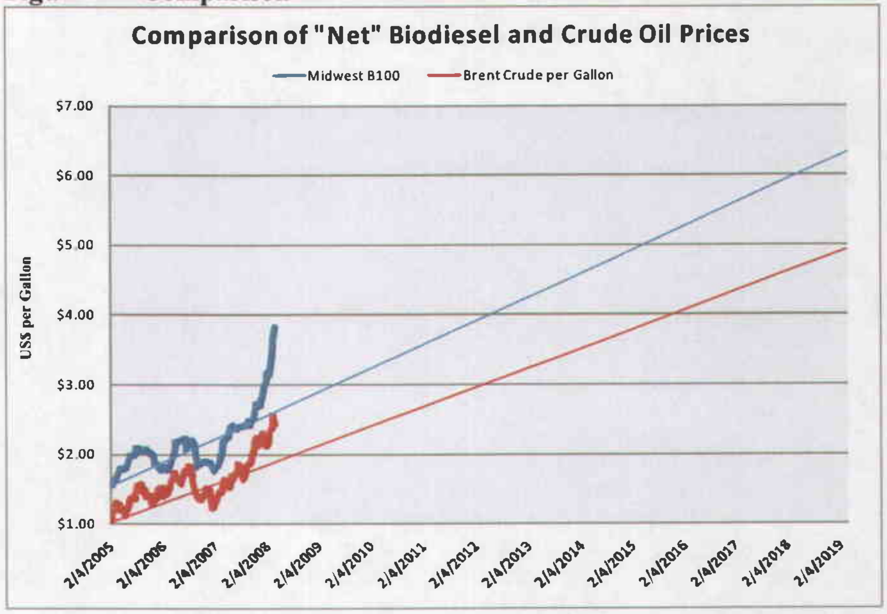
That would translate into a minimum price of about \$1.55 per gallon crude oil and thus about \$2.00 biodiesel prices if the 1.3 ratio continues to hold.

Another methodology that can be used to place some level of confidence around a given price projection is to use some measure of likely price variability. One way to estimate the amount of variation that can be expected around long-term average prices is to bracket the likely price with a measure of the historical variability of the price. The historical standard deviation of Midwest B100 prices during the period of February 2005 through March 2008 on a monthly basis was \$0.44 per gallon. If we both add and subtract the standard deviation to the "average price," we develop a range within which prices are likely to spend about two-thirds time during normal trading.

TASK 4: FINANCIAL ANALYSIS

The following chart illustrates this concept. The jagged blue line represents the actual price quotes for B100. The red line represents a 10-year projected trend of the actual prices. The green lines represent the 44-cent standard deviation range around the projected price. If we assume that the projected price represents some expected mean future price, then we expect prices to trade within that 44-cent range about two-thirds of the time. Nearly one-third of the time, prices would trade beyond those bounds.

Figure 4.7. Comparison of Net Biodiesel and Crude Oil Prices.



TASK 4: FINANCIAL ANALYSIS

Table 4.1: Trend Line Projections Based on Trend Equation of Biodiesel and Brent Crude			
Year	Point Estimate (US$ per Gallon)	Likely Range (US$ per Gallon)	Likely Range (US$ per Tonne)
2009	$3.41	$2.97 - $3.85	$914.52 - $1,185.48
2010	$3.77	$3.33 - $4.21	$1,025.37 - $1,296.33
2011	$4.14	$3.70 - $4.58	$1,139.30 - $1,410.26
2012	$4.50	$4.06 - $4.94	$1,250.15 - $1,521.11
2013	$4.87	$4.43 - $5.31	$1,364.08 - $1,635.04
2014	$5.23	$4.79 - $5.67	$1,474.93 - $1,745.89
2015	$5.60	$5.16 - $6.04	$1,588.86 - $1,859.82
2016	$5.96	$5.52 - $6.40	$1,699.71 - $1,970.67
2017	$6.33	$5.89 - $6.77	$1,813.64 - $2,084.60
2018	$6.69	$6.25 - $7.13	$1,924.49 - $2,195.45
2019	$7.06	$6.62 - $7.50	$2,038.42 - $2,309.38

4.1.3 Cash Flow Projection

Two cash flow projections have been prepared as base analysis cases. Case 1 assumes a projected biodiesel price growth as defined in Section 4.1.2.2, with zero cost and no transfer pricing of CPO raw material. Case 1 is the scenario for PTPN-III to judge the project's feasibility since they are not required to purchase CPO raw material at commodity prices.

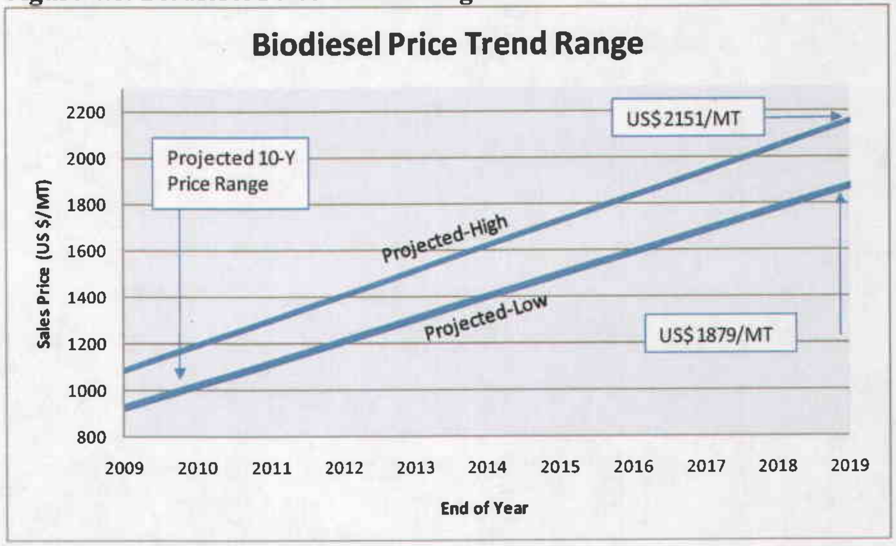
Case 2 considers project feasibility for a hypothetical comparison company that is required to purchase CPO at commodity prices. The cost trend for CPO over the analysis horizon is defined in Section 4.1.2.1. This case illustrates the economics of potential competitors to PTPN-III who are considering a biodiesel plant but who do not own palm plantations.

Both cases include sales of glycerin at a straight-line price of US$530 per tonne.

4.1.3.1 Case 1: PTPN-III with Zero CPO Raw Material Costs

The figure below indicates a 10-year price trend for biodiesel prices based on projected growth of Brent Crude Diesel price growth. The chart indicates that growth through 2019 may result in a biodiesel price range from US$1,879 to US$2,151 per tonne.

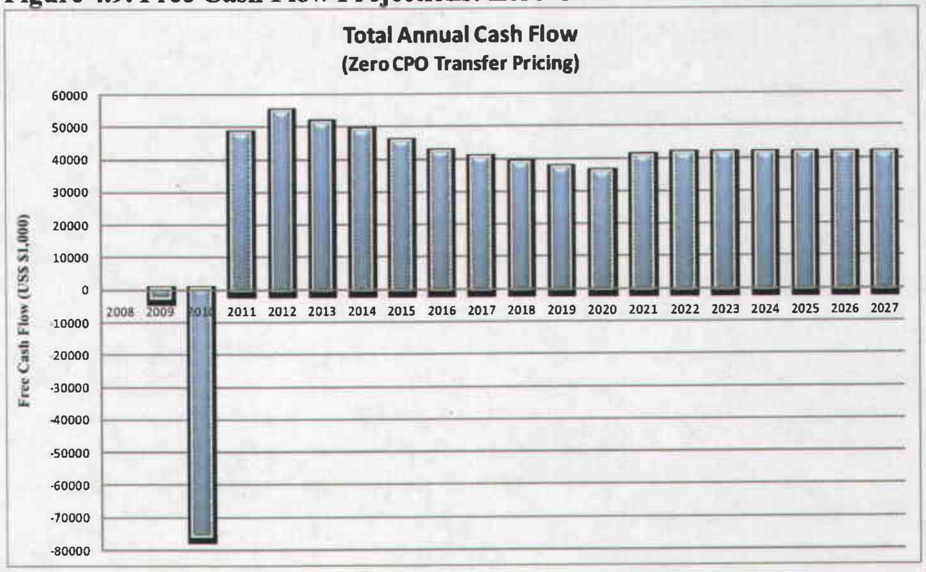
Figure 4.8. Biodiesel Price Trend Range.



The midpoint projected biodiesel price in 2019 is US$2,015 per tonne, representing an annual growth of 4.6%. This growth rate results in the free cash flows presented in the chart below. An annual 3% cost escalation for SG&A, labor, and conversion costs is included.

TASK 4: FINANCIAL ANALYSIS

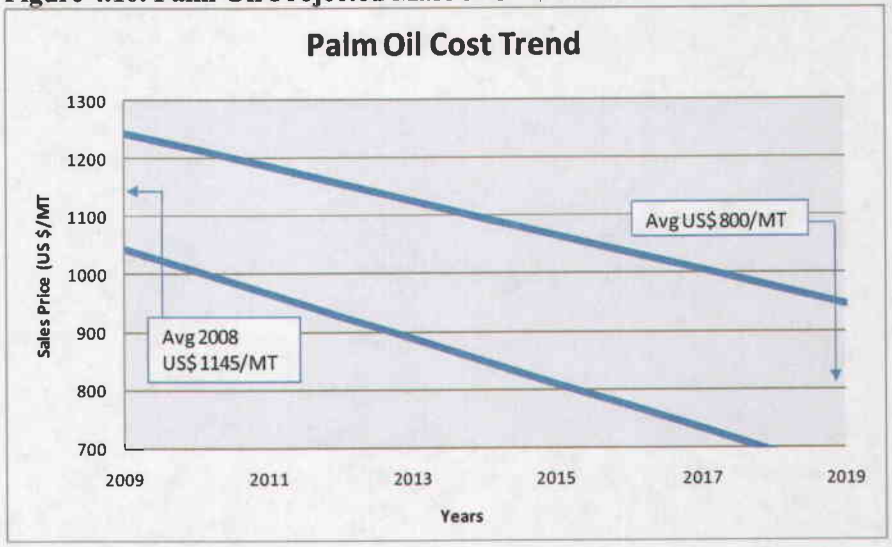
Figure 4.9. Free Cash Flow Projections: Zero CPO Costs.



4.1.3.2 Case 2: Comparison Company with Market-Based CPO Costs

The projected cash flows are significantly influenced by the cost of CPO raw material if PTPN-III chooses to apply transfer pricing of the CPO. The figure below indicates a CPO projected market cost trend based on CIF Rotterdam traded commodity prices.

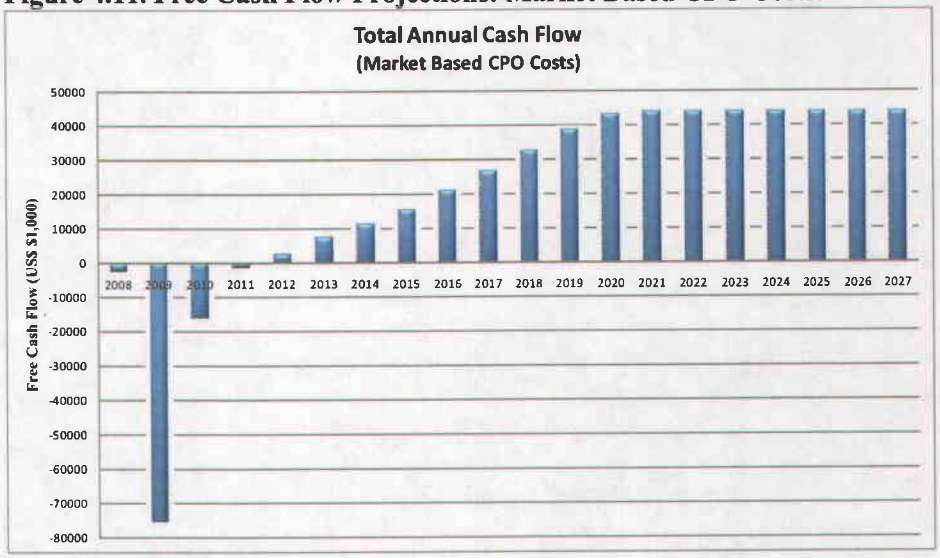
Figure 4.10. Palm Oil Projected Market Cost Trend.



TASK 4: FINANCIAL ANALYSIS

Based on the price analysis presented in Section 3 of this report, CPO is projected to reduce and reach equilibrium at US$800 per tonne by 2019 and beyond. Considering this impact to the costs of goods sold, the free cash flow for a comparison company limited to market based CPO costs is reduced, as indicated in Figure 4.11.

Figure 4.11. Free Cash Flow Projections: Market Based CPO Costs.



4.2 EQUITY INVESTORS

4.2.1 Shareholder Composition

PT Perkebunan Nusantara III is a state-owned company. 100% of the company's shares are owned by the Government of Indonesia, which is represented by the Kantor Kementrian BUMN. The BUMN agency establishes policy and coordinates the promotion of the company.

4.2.2 Debt-Equity Structure(s)

The financial modeling is based on a project Special Purpose Vehicle (SPV) of which PTPN-III is the sole equity investor at 30% of the estimated project capital cost, including working capital. The likely debt structuring would be through one lender on a limited recourse basis. Loan repayment would be secured by the revenue stream generated by current CPO sales, while debt repayment would be serviced by sales of biodiesel and power.

TASK 4: FINANCIAL ANALYSIS

4.2.3 Internal Rate(s) of Return

Internal Rate of Return (IRR) has been calculated from the pro-form cash flows presented in Section 4.1.3. The detailed statements of cash flow, income, and costs are presented in Appendix B of this report. IRR represents the return of the project to company shareholders and can be used to make a decision on proceeding with the project if it exceeds the company's benchmark rate of return. The benchmark rate of return for PTPN-III, as derived in Section 3.4.10, is 16.4%, meaning that a project should be undertaken if its IRR is greater than or equal to 16.4%.

Table 4.4A: Internal Rate of Return

Case	IRR	Proceed with Project?
Case 1: PTPN-III with Zero CPO Transfer Pricing	61.4%	YES
Case 2: Comparison Company with Market CPO Costs	6.8%	NO
Benchmark Rate of Return (WACC)	**16.4%**	

Table 4.4B presents alternate IRR values for the Biodiesel Plant and Biomass-to-Energy Power Plant on a separate basis. The data suggests that the Biomass-to-Energy power plant does not provide an economic return to shareholders when considered independently. However, recent Ministry of Energy capacity and energy charge mandate for renewable energy has increased from IDR 525/kWh to IDR 1,891/kWh; which will increase IRR values.

TASK 4: FINANCIAL ANALYSIS

Table 4.4B: Internal Rate of Return		
Case	**IRR**	**Proceed with Project?**
Case 1-A: PTPN-III with Zero CPO Transfer Pricing – Biodiesel Plant Only (fully burdened raw material and labor costs)	119.9%	YES
Case 1-B: PTPN-III including CPO Transfer Pricing – Biodiesel Plant Only (fully burdened raw material and labor costs)	23.8%	YES*
Case 1-C: Biomass-to-Energy Plant Only (zero labor and raw material cost burden)	-9.1%	NO
Benchmark Rate of Return (WACC)	**16.4%**	

* CPO raw material cost set at September 12, 2008 of US$850/tonne CIF Rotterdam

4.2.4 Net Present Value

Net Present Value (NPV) is a criterion similar to IRR in evaluating projects. NPV considers the initial capital outlay and present value of future discounted cash flows generated by the project. The cash flows are discounted at a rate of return equal to the company's investment threshold, or their investment benchmark, rate of return. When the project rate of return is equal to the benchmark rate of return, then the NPV is zero, implying that projects with an NPV greater than or equal to zero should be selected. NPV for the two project cases are calculated using a discount rate equal to PTPN-III's WACC of 16.4%.

Table 4.5: Net Present Value (Discount Rate = 16.4%)		
Case	**NPV (US$ 1,000)**	**Proceed with Project?**
Case 1: PTPN-III with Zero CPO Transfer Pricing	$ 122,289	YES
Case 2: Comparison Company with Market CPO Costs	($ 37,051)	NO

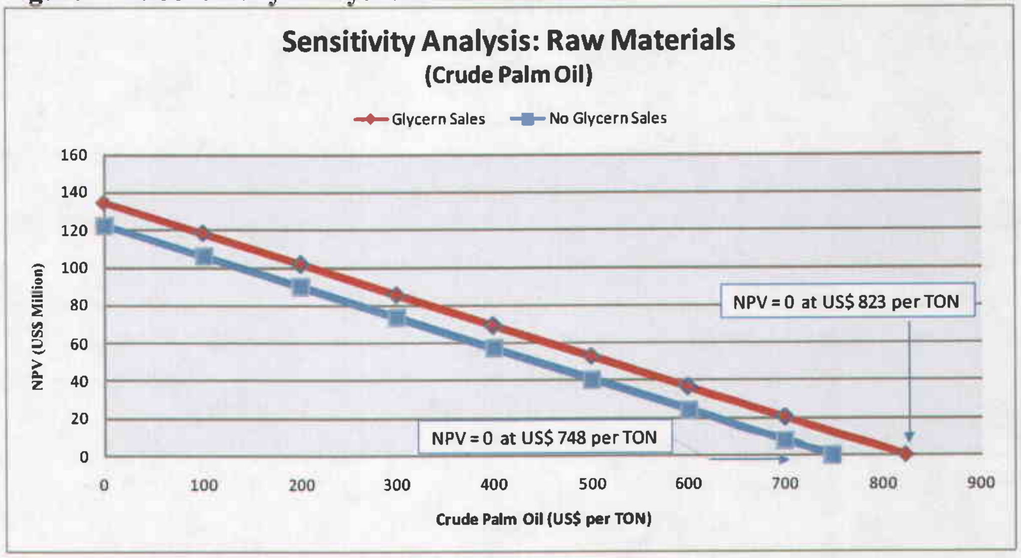
TASK 4: FINANCIAL ANALYSIS

4.2.5 Sensitivity Analysis

A sensitivity analysis of the economic model was conducted through a switching factor method where isolated variables are adjusted until the NPV equals zero. This analysis is useful in presenting a range of conditions where the project is economical.

The analysis was conducted on the CPO Transfer Pricing case (Case 2) to demonstrate the impact of CPO commodity pricing, biodiesel sales volume, and biodiesel sales price on the economics of the project. The results are presented in the following three charts.

Figure 4.12. Sensitivity Analysis: Raw Materials.



TASK 4: FINANCIAL ANALYSIS

Figure 4.13. Sensitivity Analysis. Biodiesel Sales Price.

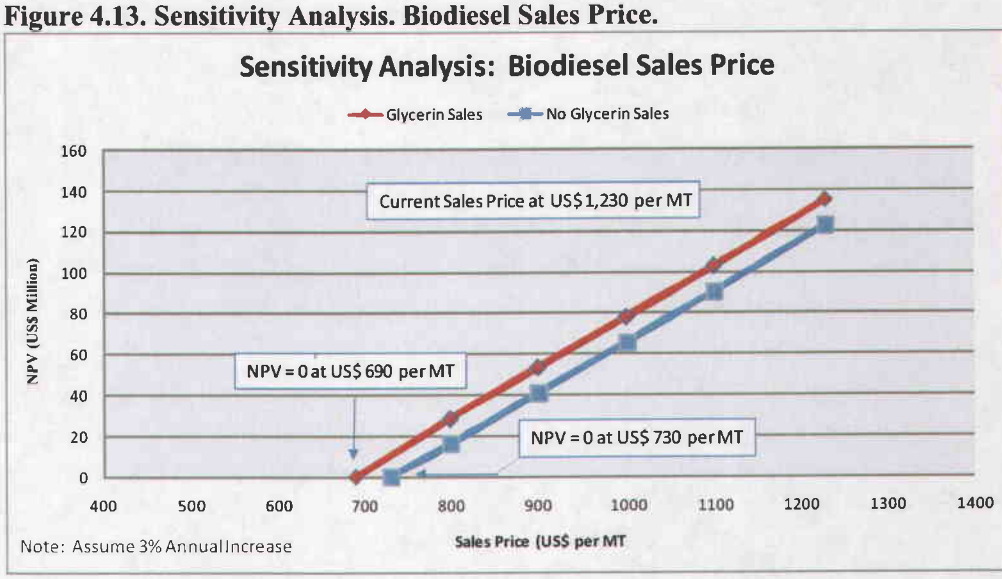
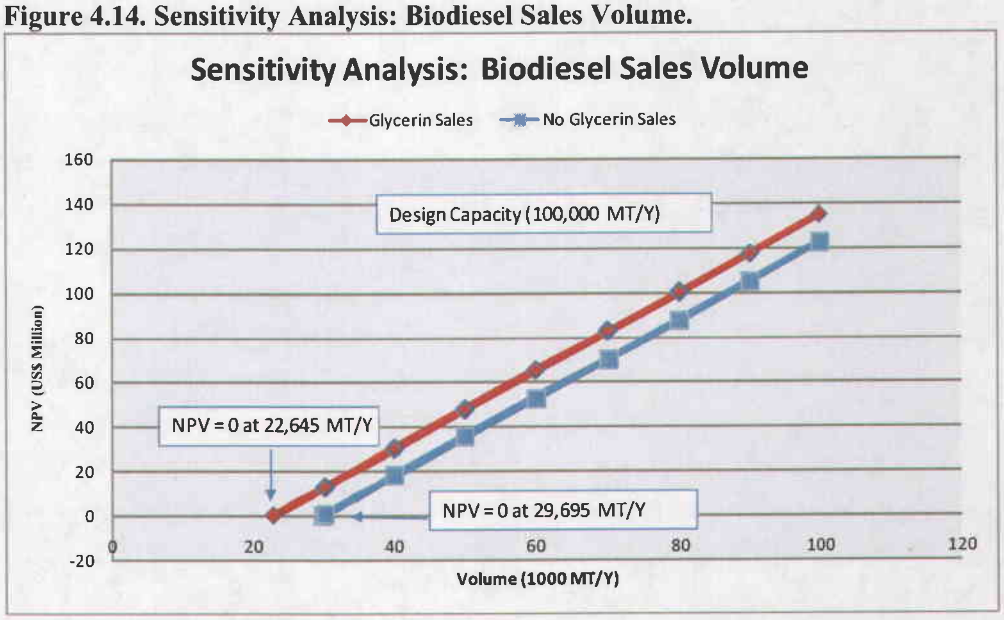


Figure 4.14. Sensitivity Analysis: Biodiesel Sales Volume.



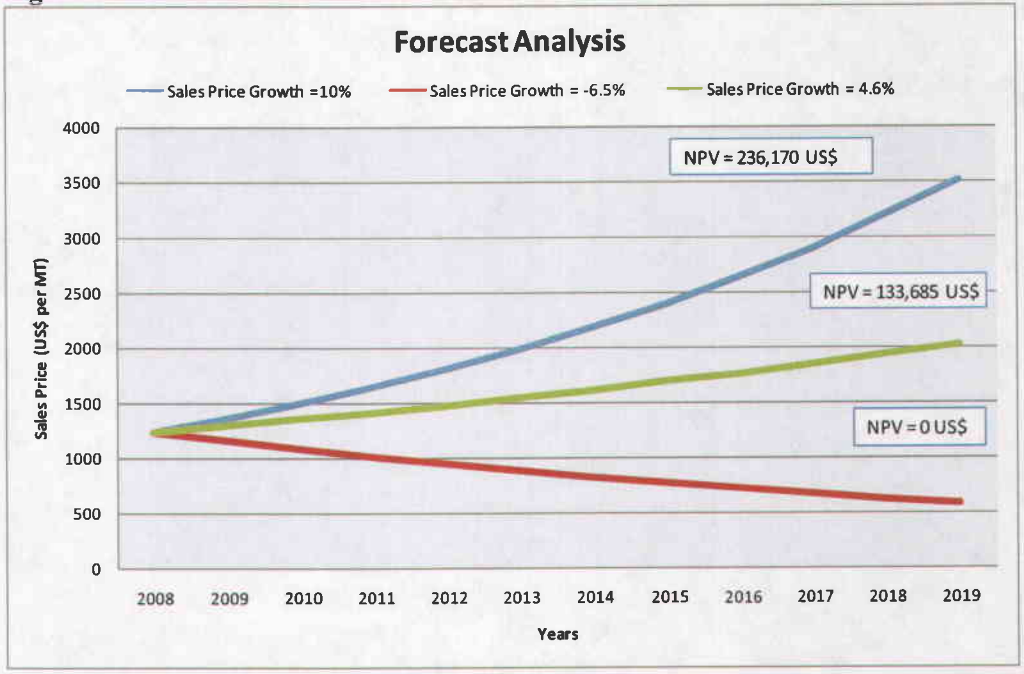
TASK 4: FINANCIAL ANALYSIS

The charts indicate that when any of the following switching factors (adjusted one at a time, with all other factors remaining the same) reaches the values indicated, the project is no longer attractive economically:

CPO Commodity Price	= US$823 per tonne or greater
Biodiesel Sales Price	= US$730 or lower
Biodiesel Sales Volume	= 29,695 tonnes per year or lower

Figure 4.15 explores a range of annual growth rates in biodiesel price over a 10-year period. 10% was chosen as a best-case annual price growth rate to indicate a potential upper limit, and a price growth of -23% was chosen as a zero NPV case, where the project would not be selected. The intermediate curve of 4.6% annual price growth is the assumed price basis used in the cash flow analysis. The analysis demonstrates that the project, without the cost of CPO raw material, is quite resilient to changes in biodiesel spot prices.

Figure 4.15. Annual Growth Rates over a 10-Year Period.



TASK 4: FINANCIAL ANALYSIS

4.3 FINANCIAL DOCUMENTATION

4.3.1 Shareholders

PTPN-III is 100% owned by the Government of the Republic of Indonesia. According to PTPN'III's statements:

> *PT. Perkebunan Nusantara III (Persero) was incorporated through By Laws of the company notarized by Harun Kamil, SH, Number 36 on 11 March 1996, and legalized by the Minister of Justice of the Government of Indonesia through Decree No. C2 8331.HT.01.01.TH.96 on 8 August 1996, and published in the Gazette of the Republic of Indonesia No. 81 of 1996, and Annexure to the Gazette No. 8674 of 1996.*

4.3.2 Financial Lending Institutions

Prime Capital Services, a business unit of Prime Engineering specializing in project finance, conducted a financial lending institution exploratory survey on behalf of the potential PTPN-III biodiesel and waste-to-energy project. Vice President- or Director-level senior managers in the Project and Structured Finance divisions of five banks in Singapore were interviewed.

The renewable energy sector is a focus area for most commercial banks, in particular when deploying project finance capital into developing nations. Indonesia and the biodiesel market sector fit many Singapore banks' target borrower profile.

PTPN-III's current sales of CPO can be used as security to guarantee loan repayment and would reduce PTPN-III's risk profile. This would classify the project finance borrowing as a limited recourse loan as the lender would have partial, but not complete, access to the borrower's other assets. A non-recourse project finance loan would service the debt only with cash flow generated by the sale of biodiesel and power, providing additional balance sheet isolation from the project but resulting in a higher borrowing cost.

The borrowing capacity of PTPN-III on a project of this size may be a maximum of 70%. The credit rating of PTPN-III, since it is 100% owned by the Government of Indonesia, is limited to the credit ceiling of Indonesia's sovereign risk rating of BB.

TASK 4: FINANCIAL ANALYSIS

4.3.3 Financial Indicators

The following table indicates typical loan covenant multiples for the zero CPO transfer price case. In general, these multiples are strong for a biodiesel facility due to the absence of commodity CPO pricing as a component of COGS.

Table 4.6: Loan Covenant Key Indicators

	2010	2011	2012	2013	2014	2015	2016
Debt service coverage – cash flow multiple over debt	4.70	5.49	5.17	4.93	4.61	4.32	4.13
Interest coverage – EBITDA multiple over scheduled interest payments	15.03	15.94	17.37	19.71	23.87	32.53	59.18
Leverage – EBITDA to net debt ratio	1.76	1.92	2.18	2.63	3.58	6.51	-

Loan Life Cover Ratio (LLCR), which is the ratio of present value of Cash Available for Debt Service to the loan opening balance, is **5.26** for the zero CPO transfer price case. Most financial institutions consider LLCR greater than or equal to 2.00 as the minimum LLCR to finance a project. If considering commodity cost of CPO as part of the project COGS, then the LLCR is reduced to 0.31.

4.4 FINANCIAL ANALYSIS CONCLUSION

The analysis in this section indicates that the Biodiesel and Biomass-to-Energy project is feasible and that PTPN-III should proceed with the project. PTPN-III is in a unique cost position compared to other pure play biodiesel manufacturers in that they are isolated from market based CPO costs, which represent significant raw material cost savings.

TASK 5: REGULATORY ANALYSIS

SECTION 5 – REGULATORY ANALYSIS (TASK 5)

5.1 PERMITTING AND LICENSING PROCESSES

There are several legal documents that should be obtained to develop the business if the project owner is a new enterprise:

- Letter of Agreement for Domestic Capital Investment, issued by the Deputy of Division of the Capital Investment Service in the name of the Head of the Investment Coordinating Board
- NPWP (obligation to pay taxes), issued by the TUP Section Head in the name of the Head of Tax Service Office
- Document proving registration as taxpayer, issued by the TUP Section Head in the name of the Head of Tax Service Office
- Permit of Natural Gas and Oil Supporting Service, issued by the Head of Mining Service, North Sumatra Province
- Document of Company Domicile, issued by the Head of Sub-district Office, Medan

In addition, the following legal documents are obligatory for conducting the business:

- Certificate of Company Registration ("TDP")
- Environmental Management/Environmental Monitoring Effort ("UKL/UPL")
- Limited Importer Identification Number ("APIT")
- Disturbances Act Permit ("HO")
- Building Construction Permit ("IMB")

The Government of Indonesia has issued several policies that support the biofuel industry's development:

- President Regulation No. 5/2006 for National Energy Policy that encourages the use of biofuel for more than 5% of the total energy consumption in the year 2025
- President Instruction No. 1/2006 for Biofuel Acceleration Program
- President Decree No. 10/2006 for National Biofuel Development Team
- Government Regulation No. 1/2007 for Tax Incentives for Biofuel Producers
- Ministry of Agriculture Decree 2007 for Land Allocation
- Government Regulation No. 8/2007 Regarding Biofuel Fund

5.2 PLANNING AND DESIGN

Planning and design must be standardized throughout the project, within the main process plant, utilities, and offsites. Codes, standards, and specifications will specify a required level of quality. In general, basic codes, standards, and specifications are those found in the United States (ASME, ASTM, API, etc). Selection materials, codes, standards, and specifications for equipment and materials shall be at least equivalent to those specified in the following paragraphs.

Within the main process plant, unless specifically stated elsewhere, selection of materials must conform to applicable codes, standards, and specifications. The assigned contractor may propose alternative specifications so long as these specifications are common, proven, and generally equivalent. Furthermore, use of alternative specifications does not relieve contractor obligations, if the generalized requirements stated in the above paragraph are not applicable. For items not covered by codes or if no suitable codes apply, other manufacturing and safety standards developed or used in the biodiesel industry shall be used, subject to the Project Owner's approval.

Local Indonesian materials are to be supplied in accordance with SII (Standard Industry Indonesia) standards. The contractor determines which standards exist, keeping in mind the Indonesian Government's policy to use the maximum possible amount of local Indonesian materials and labor during project design and procurement.

Plant Layout: Specific Principles

- Plant structures will be supplied with structures for hoists of proper capacity to lift the heaviest part of a single piece of installed equipment for servicing, maintenance, and replacement.
- Trolley beams, davits, hitching points, etc. will be provided with appropriate removable hoist mechanisms for charging and discharging catalysts, chemicals, packing rings, etc. at sufficient speed and efficiency to ensure rapid plant turnaround.
- The plant layout will feature access and maintenance areas for mobile equipment allowing removal of exchangers, tube bundles, tower tray handling, changing catalyst, chemicals and packing, etc.
- Piping and all other services will be arranged so as to permit ready access of cranes for removal of equipment for inspection and/or servicing.
- Sufficient space shall be provided around fixed-tube sheets and floating head exchangers and heaters to permit all tubes to be rodded and/or rattled during cleaning.
- Minimum headroom under all projecting structures shall be as follows:
  - Platforms, walkways, structural bracing: 2.15 m
  - Truck and equipment access ways: 4.25 m
  - Roads: 5.50 m
- Escape ladders shall be provided on all structures based on the hazards to which personnel are exposed in specific areas.
- Hoops shall be provided on vertical ladders exceeding 3.70 meters in height.
- Hoops shall be placed at a height of 2.40 meters from the landing.
- At least two entirely separate and well-spaced escape routes shall be provided from all operating floors.
- Handrails shall consist of two horizontal members and a toe-plate supported by posts at suitable intervals.

TASK 5: REGULATORY ANALYSIS

- Contractor's standard may be acceptable, but is subject to Owner approval.
- Ladder rungs shall be spaced at intervals of 0.30 m.
- Stairway slope shall not exceed 45^0 from horizontal line.
- Risers shall not exceed 0.25 m.
- All areas and routes at grade level that require frequent access or use shall have finished concrete surfaces.
- Clearance in operating aisles shall be a minimum of 1.5 meters.
- Where structural columns are located within these areas, a minimum clearance of 0.75 m shall be provided between the columns and equipment projections.
- Vertical ladders shall not exceed a height of more than 10 m without a rest platform.
- Buildings shall be provided with properly sized ridge ventilators to supply good ventilation and, at the same time, provide good protection against rains, and the building design shall be extendable.

Pressure Vessels

- Pressure vessels shall be designed and constructed in accordance with Section VIII of the ASME Boiler and Pressure Code (latest edition and addenda) Division I and shall be stamped by a qualified authority.
- Equipment subject to exceptionally high pressure and/or temperature may be designed and constructed in accordance with codes of practice that permit higher allowable stresses than ASME Division I.
- The following listing of codes and standards shall be used, but is not intended to be a complete list of such codes and standards. Alternatives codes or manufacturer standards may be allowed, subject to Owner approval, but shall not relieve contractor obligations. Manufacturer standards for:
  - Centrifugal Pumps
  - Special-Purpose Gear Units
  - Lubrication, Shaft Sealing and Control Oil System for Special-Purpose Applications
  - Sound Control of Mechanical Equipment
  - Centrifugal Compressors
  - Reciprocating Compressors
  - Rotary Type Positive Displacement Compressors
  - Non-Contacting Vibration and Axial Position Monitoring Systems
  - Special-purpose Coupling
  - Packaged, Integrally Geared Centrifugal Plant and Instrument Air Compressors
  - Positive Displacement Pumps-Reciprocating.
  - Positive Displacement Pumps-Controlled Volume
  - Positive Displacement Pumps-Rotary

ASME Standards

- Boiler and Pressure Vessel Code Section I Power Boilers and Section VIII Division I.

TASK 5: REGULATORY ANALYSIS

AGMA Standards

- 420 : Practice for Enclosed Reducers or Increase Using Spur, Helical, Herringbone and Spiral Bevel Gears
- 421: Practice for High-Speed Helical and Herringbone Gear Units

NEMA Standards: Specification for Civil and Structural
Requirements shall be carried out in accordance with the latest editions of the following:

1. SKBI-1.3.53, 1987. UDC: 624.042
   "Indonesian Loading Code for Building"
2. SKBI-1.3.53, 1987. UDC: 699.841
   "Earthquake Resistant Code for Building in Indonesia"
3. SK-SNI-T-15-1991-03
   "Indonesian Reinforced Concrete Code"
4. SKBI-1.3.55, 19897
   "Indonesian Structural Steel Design Code"
5. ACI-318, 1999
   "American Concrete Institute"
   Building Code Requirement for Structural Concrete
6. AISC 1991 ASD Series
   "American Institute of Steel Construction"
   ASD Manual of Steel Construction, 9th edition
7. ASTM "American Society for Testing & Materials"

ASTM C 150-97a	Portland Cement
ASTM C 33-97	Concrete Aggregate
ASTM A 615-96a	Deformed and Plain Billet Steel Bars for Concrete Reinforcement
ASTM A 36-97a	Carbon Structural Steel
ASTM A 307-94	Carbon Steel Bolt and Stud, 60000 PSI Tensile Strength
ASTM A 325-97	Structural Bolt, Steel, heat treated, 120/105 KSI Minimum Tensile Strength

8. JIS "Japanese Industrial Standard"

JIS A 5335	PC Pile
JIS G 3101	Structural Steel
JIS B 1180	Ordinary Structural Bolt
JIS B 1186	High-Strength Bolt

9. SII "Indonesian Industrial Standard"

SII 0136-84	Reinforcing Steel Bar

TASK 5: REGULATORY ANALYSIS

5.3 CONSTRUCTION LICENSES

5.3.1 Location Permit ***(Ijin Lokasi)*** to Establish the Plant

Note: Documents and information required are different for each region. Generally, the documents required are:

- Copy of Deed of Establishment of the Company
- Copy of Entire Deeds of the Company evidencing the change of capital structure, company's management, and Shareholders
- Copy of TDP, NPWP, ID card

Issuer: Local Government

5.3.2 Certificate for Right to Build ***(Sertifikat Hak Guna Bangunan)***

Submit an application to local government with documents/information.

Issuer: Land Office

5.3.3 Permit to Build ***(Ijin Mendirikan Bangunan/IMB)***

Documents required include:

- Land Certificate
- Sketch Plan
- Application from Building Owner

Issuer: Local Government

5.3.4 License for Construction Service for the construction of the plant ***(Ijin Usaha Jasa Konstruksi - IUJK)***

Documents required include:

- Copy of Deed of Establishment of the Company
- Copy of entire deeds of the Company evidencing the change of capital structure, company's management, and Shareholders
- Copy of TDP, NPWP,ID card
- Enclosure stating details information regarding the projects' equipments
- Copy of Identity of Construction Service Association member

Issuer: Local Government (Regent / Mayor) pursuant to the location of business

TASK 5: REGULATORY ANALYSIS

5.4 GENERAL COMPANY LICENSES

5.4.1 Processing the Domicile Permit and/or Business Place Permit (*Surat Keterangan Domisili Perusahaan and/or Surat Ijin Tempat Usaha*)

Documents required include:
- Identity Card of the Director
- Deed of Establishment and Articles of Association of the Company
- Statement Letter from the Building Management/Copy of IMB
- Power of Attorney to Proxy to Apply for the Permit
- Cover Letter

Issuer: Local Government

5.4.2 Tax Identification Number ("**NPWP**") of the Company and Entrepreneur Tax Number (*Nomor Pokok Wajib Pajak dan Surat Keterangan Pengusaha Kena Pajak)*

Documents required include:
- Identity Card of the Director
- Deed of Establishment and Articles of Association of the Company
- Statement Letter from the Building Management
- Domicile Permit
- Form from the Tax Office (already filled in)
- Cover letter

Issuer: Tax Office

5.4.3 Letter of the Approval of Articles of Association of the Company

Documents required include:
- Identity Card of the Director
- Deed of Establishment and Articles of Association of the Company
- Statement Letter from the Building Management
- Domicile Permit
- NPWP
- Application letter
- Evidence of:
  - Approval for the use of name
  - Ratification of the status of the Company as a legal entity

Issuer: The Company
Approved by Department of Manpower

5.5.4 Mandatory Report of Employee Welfare Facility Implementation (***Wajib Lapor Penyelenggaraan Kesejahteraan Pekerja di Perusahaan***)

- Made by the Company

Approved by Department of Manpower

5.5.5 License for Deviation from Working Hours and Breaks (***Izin Penyimpangan Waktu Kerja dan Waktu Istirahat***)

Documents required include:
- Application Letter from the Company
- Form from Manpower Office (already filled in)

Note: Given by the Department of Manpower to the Company subject to the application submitted by the Company

5.5.6 Licenses Related to Foreign Workers

Examples:
- Expatriate Employment Plan (***Rencana Penggunaan Tenaga Kerja Asing/RPTKA***)
- Expatriate Work Permit (***Ijin Kerja Tenaga Asing*/IKTA**)

Documents required include:
- Signed and duty-stamped POA to process the RPTKA
- Completed RPTKA form
- Copy of Article of Association of the Company and its amendments stating the last composition of the Board of Directors and Board of Commissioners, complete with approval from the Minister of Justice
- Letter of Domicile of the Company
- Copy of Foreign Investment Approval stated the amount of foreign manpower approved (BKPM Approval Form IIIB – SP BKPM)
- Organization structure stating the position of the foreign worker
- Copy of the letter of appointment of Indonesian worker as colleague (*Penunjukan TKI Pendamping*)
- Copy of the Evidence of the Obligation to Report of Manpower Based on Law No. 7 of 1981 regarding Obligation to Report of Manpower
- Copy of Tax Payer Number of the Company (NPWP)

TASK 5: REGULATORY ANALYSIS

- Curriculum Vitae and University Diploma of the foreign worker (only for non-management employees; for Directors and Commissioners the diploma shall not be required)
- Signed and duty-stamped POA to submit recommendation TA.01
- Copy of diploma and or educational certificate; also, working experience in English or its translation in Bahasa Indonesia (only for non-management employees; for Directors and Commissioners the diploma shall not be required)
- Copy of Deed or Minutes of General Meeting of Shareholders regarding the appointment for position in Board of Directors
- Copy of working contract between the company and the foreign worker
- Copy of the current Decree of RPTKA
- Copy of LKPM last period
- Copy of the Identification Card of the Indonesian Worker appointed as colleague (TKI Pendamping)
- Evidence of IMTA if the foreign worker once worked in the company:
    - 30 (thirty) colored photos, 4x6 cm and 2x3 cm [red background]
    - Signed and duty-stamped POA to process VITAS
    - Copy of valid passport for each foreign worker
    - Application Letter and Sponsor Letter from the Company
    - Departure Card
    - Copy of Blue Book
    - Evidence of payment of fund of skills and expertise improvement (*Dana Pengembangan Keahlian dan Keterampilan – "**DPKK**")*

Issuer: Department of Manpower

5.6 BIODIESEL REFINERY LICENSES

5.6.1 Statement letter bearing the appropriate duty stamp regarding the applicant's undertaking to comply with prevailing regulations to obtain a business license for trading of biofuel (***Surat Pernyataan Kesanggupan memenuhi Peraturan Perundangan untuk Ijin Usaha Niaga Bahan Bakar Nabati sebagai Bahan Bakar Lain)***.

Documents required include:

- Statement letter made by the authorized representative of the Company

Issuer: The Company

5.6.2 Statement letter bearing the appropriate duty stamp regarding the applicant's availability for a location inspection to obtain a business license for trading of biofuel

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Surat Pernyataan Kesediaan Dilakukan Inspeksi Lapangan untuk Ijin Usaha Niaga Bahan Bakar Nabati sebagai Bahan Bakar Lain).

Documents required include:

- Statement letter made by the authorized representative of the Company

Issuer: The Company

5.6.3 Certification of standard and specification quality for biofuel to obtain a business license for trading of biofuel (***Sertifikasi Data Standard dan Mutu [spesifikasi] bahan baker nabati***).

Note: Documents/information must be relevant with the technical data regarding biofuel provided by the Company.

Issuer: Accredited laboratory (e.g., Sucofindo or Lemigas Laboratory)

5.6.4 Export license for export of biofuel (***Surat Ijin Eksport***).

Documents required include:
- Recommendation from Minister of Energy and Mineral Resources
- Company Registration Certificate
- Application Letter
- Tax Identification Number

Issuer: Department of Trade

5.6.5 Statement letter bearing the appropriate duty stamp regarding the availability of applicant to run its business to obtain a business license for trading of biofuel (***Surat Pernyataan kelayakan Usaha untuk memperoleh Ijin Usaha Niaga Bahan Bakar Nabati sebagai Bahan Bakar Lain).***

Documents required include:
- Statement letter made by the authorized representative of the Company

The statement letter contains: amount of investment, estimation of cash flow, value of machines and equipments.

Issuer: The Company

5.6.6 Statement letter bearing the appropriate duty stamp regarding the availability of applicant to produce/supply biofuel to obtain a business license for trading of biofuel

TASK 5: REGULATORY ANALYSIS

5.7 WASTE-TO-ENERGY POWER PLANT LICENSES

5.7.1 Business License for Electricity Power ***(Surat Ijin Usaha Ketenagalistrikan)*** for Company's own use and for selling to the PLN

Required information includes:

- Administration requirements: e.g., identity of the applicant, deed of establishment and articles of association, company's profile, NPWP
- Technical requirements: e.g., feasibility study, location of the installation, single-line diagram, type and capacity of business, Electricity Supply Effort Plan/Rencana Usaha Penyediaan Tenaga Listrik (RUPTL), development schedules, operational schedules, environmental licenses

Issuer: Bupati/Gubernur/Menteri (depends on the location)

5.7.2 Certificate for Proper Operation of Electrical Equipment (**Sertifikat Layak Operasi untuk peralatan tenaga listrik**)

Note: Depends to the results of feasibility studies by the Directorate General of Electricity and Energy Treatment

Issuer: Directorate General of Electricity and Energy Treatment

5.7.3 The Government of Indonesia announced five initiatives to follow up the UNFCCC ratification in 1994:

1. Promoting the utilization of renewable energy
2. Promoting the utilization of clean energy and energy-efficient technology in industrial and commercial sectors
3. Promoting the efficient use of energy
4. Gradually eliminating energy market distortions through stepwise removal of various subsidies
5. Restructuring the energy sector to allow more participation of private entities

The objective of this Waste-to-Energy Power Plant Project is to generate electricity and use the excess capacity for sale to the grid of PLN (the State Electricity Company of Indonesia) through utilization of biomass residue from palm oil mills. This renewable energy project will offset the requirement of diesel generation to satisfy the ever-growing demand of electricity in the surrounding area. Thus this project would fit the principles and rules of Clean Development Mechanism (CDM).

TASK 5: REGULATORY ANALYSIS

The project is in keeping with the national drive for the inclusion of renewable energy technologies. With the recent implementation of regional autonomy, the regional PLN will be looking to source alternative means of electrical production. This is particularly important in areas like North Sumatra, which have an electricity deficit and require additional generation to support communities. The project will provide many social and economic benefits and aid rural electrification, in accordance with government objectives.

Other regulation or policies that support renewable energy development in Indonesia, among others are:

- Indonesian Government Policy by the Ministry of Energy & Mines Decree No. 20/2002 on Electricity. The Energy Ministry's Director General stated that the government objectives are: achieving electrification ratio of 90% by the year 2010; reaching renewable (non large hydro) energy shares in energy mix of at least 5% by 2020; and realizing energy infrastructure to maximize public access to electricity
- Energy & Mining Ministerial Decree No. 002 Year 2005
- Renewable Energy Development and Energy Conservation Policy

5.8 ENVIRONMENTAL LICENSES

5.8.1 Processing Environmental Management Effort (**UKL/UPL**) or Environmental Impact Assessment (**Analisis Mengenai Dampak Lingkungan/AMDAL**) to prove environmental management.

The determination of whether an AMDAL or UKL/UPL is required depends on the applicant's production capacity.

Requires following terms in applying for an AMDAL, which are:

1. Framework of reference
2. Analysis of environmental impacts, the plan for environmental management and the plan for environmental monitoring

For UKL/UPL, the document must be approved by the Director of Technical and Environmental on Oil and Gas.

For AMDAL, the document must be approved by the Ministry of Environment.

5.8.2 Copy of Nuisance Act Permit (***Ijin Undang-undang Gangguan***)

TASK 5: REGULATORY ANALYSIS

Documents required include:

- Deed of establishment and articles of association of the Company
- Identity card of the applicant
- Copy of Permit to Build (IMB)
- Approval from local community

Issuer: Local Government

5.8.3 License of Water Intake (***Surat izin Pengambilan Air – SIPA***)

Note: Depends on the results of feasibility studies

Issuer: Local Government

5.9 SAFETY REGULATORY REQUIREMENTS

Major precautions are necessary to avoid poisoning, fire, and contamination of soil and water resources. Both methanol and the catalyst, which are required to convert vegetable oil into biodiesel, are dangerous chemicals. Biodiesel production facilities may be subject to regulation by the Ministry of Environment Protection or Kementrian Lingkungan Hidup (KLH) and other entities depending on their size and commercial status. Disposal of byproducts is regulated by the KLH.

The following environment and safety regulations must be complied with:

- UU RI No. 23/1997 Environmental Management System
- UU RI No. 1/1970 Occupational Health & Safety
- SMK3 Indonesian Occupational Health and Safety Management System Specification

TASK 6: DEVELOPMENTAL IMPACT

SECTION 6 – DEVELOPMENTAL IMPACT ANALYSIS (TASK 6)

6.1 ANTICIPATED ECONOMIC DEVELOPMENT OUTCOMES

The PTPN-III biodiesel project, and the general Indonesian biodiesel sector as a whole, is anticipated to have a substitutive effect on Indonesia's economic development. Reduced petroleum output (Source: *Guerin Energizing Indonesia*) and Indonesia's recent withdrawal from OPEC have the potential to encourage a contraction of Indonesia's petroleum energy sector. The potential reduction in available management, marketing, engineering, and labor jobs could create a talent pool of former petroleum skilled professional and technical staff that could transfer into Indonesia's biofuels sector where their skills in a similar industry can be readily applied.

6.2 SPINOFF BENEFITS

6.2.1 Infrastructure

Construction of a new commercial-scale biodiesel facility in Sei Mangke will have infrastructure spinoff benefits in both transportation and power.

Transportation: Commercial quantities of bulk biodiesel will need to be stored at the port site of Kuala Tanjung and shipped via seagoing barge to larger ports in Sumatra or Java. The benefit of the project would be to provide port improvements including additional liquid loading systems, dredging, and mooring structures that could be utilized for other bulk liquids or for dry bulk loading and unloading.

Power: The addition of approximately 10 MW of available power to the PLN grid from the biomass waste-to-energy plant may also contribute to economic development of other businesses in the Sei Mangke local area.

6.2.2 Co-Products

The potential co-production of betacarotene presents a unique commercial opportunity to PTPN-III. Experience with manufacturing this category of specialty product will encourage additional skills development that could potentially attract new higher technology and specialty chemical businesses to the local area.

6.3 DEMONSTRATION EFFECTS

Demonstration effects are supplemental outcomes that the successful project may stimulate in the larger macro economy based on the project's unique characteristics. PTPN-III has the opportunity to present the project as a model or showcase to encourage and inspire other positive initiatives in Indonesia. One possible demonstration effect would be how Indonesian

TASK 6: DEVELOPMENTAL IMPACT

biodiesel producers could differentiate themselves from other biodiesel producers. Possible differentiating factors may include:

- Zero Waste: The residual biomass is programmed to be used as boiler fuel to self-power the biodiesel plant. Furnace ash is collected and land applied to the plantation as a source of nitrate fertilizer. We have also identified a gray water reuse scheme in the biodiesel wash columns that greatly reduces fresh water consumption.

- Community-Building: The presence of a commercial-scale biodiesel plant will provide both power and skills development that can advance and diversify rural and primarily agricultural-based economies throughout Indonesia.

- Specialty Products: The potential of producing betacarotene may also contribute to more advanced skills development and higher technology applications in Indonesia.

6.4 PROJECT BENEFIT ESTIMATES

6.4.1 Infrastructure

Section 6.2.1 indicates the direct spinoff benefits to the local area infrastructure. An indirect substitutive benefit of a growing biofuels sector in Indonesia would be to provide a use for obsolete or underutilized petroleum infrastructure. Existing bulk liquids terminals throughout Indonesia could be redesigned to store, handle, and transport biofuels and improve the utilization of otherwise idle assets.

6.4.2 Industry

PTPN-III is a company with expertise in the palm oil, rubber, and cocoa industries, each of which are agricultural commodity sectors. The project will potentially provide a demonstration to other agricultural-based companies in Indonesia of how to diversify their businesses into the energy and power sector while still maintaining their companies' core missions.

6.4.3 Market-Oriented Reforms

The nature of this project's development may promote reforms in the Indonesian capital markets. The introduction of foreign project finance, potential joint ventures with foreign investors, and trade support from the US Ex-Im Bank or Overseas Private Investment Corporation (OPIC) will present new ways in which capital can be raised for energy and power projects in Indonesia.

TASK 6: DEVELOPMENTAL IMPACT

6.4.4 Human Capacity Building and Technology Transfer

Indonesian internal technology transfer may result as an outcome of additional biodiesel production in Indonesia, as skilled professional and technical staff from Indonesia's oil and gas sector transfer into the biodiesel sector. These employees will bring with them the skills of fuels processing, energy commodity marketing, and more advanced equipment operation and maintenance.

External technology transfer is also likely where expatriate experts are engaged for the training and development of local Indonesian staff, or Indonesians from Java or other petroleum or chemical areas in Indonesia transfer into Sei Mangke for employment or training.

6.4.5 Productivity Enhancement

PTPN-III will be engaged in the sale of two commodities as a result of this project: palm oil and biodiesel. Because these commodities' spot prices change according to independent markets, they will be required to optimize production and product mix, which will encourage higher productivity and process optimization. The introduction of skilled petroleum and chemical staff to the company will transfer those skills to PTPN-III for improved enhancements to productivity and production quality.

TASK 7: ENVIRONMENTAL

SECTION 7 – PRELIMINARY ENVIRONMENTAL ANALYSIS (TASK 7)

7.1 ENVIRONMENTAL IMPACT ASSESSMENT

7.1.1 Biodiesel Pollution Prevention and Controls

7.1.1.1 Guidelines regulating pollution prevention and controls for the biodiesel production process are published by International Finance Corporation in *Environmental, Health, and Safety Guidelines Oleochemicals Manufacturing*. The recommendations below are based on this document and general Good Industry Practices.

7.1.1.2 The main waste stream generated by the production of biodiesel is glycerin. For a production of 100,000 tonnes/year of biodiesel, 33,300 tonnes of glycerin solution is produced. Typically, this solution contains a low concentration of glycerol and relatively high content of salts. Table 7.1 indicates typical physical properties of the waste glycerin stream.

Table 7.1: Typical Glycerin Properties

Parameter	Units	Values
Density	gr/cm^3	1.112 – 1.114
Refraction index	-	1.37 – 1.38
Conductivity	uS	35 000 – 39 000
pH	-	6 - 7
Glycerol	mass %	20 - 25
Sulfates	mass %	< 5
Ashes	mass %	4 - 7
Suspended Solids	mg/l	200 – 1 000
COD	mg/l	250 000 – 400 000
BOD_5	mg/l	70 000 – 120 000
Fe	ppm	2 – 2.5
Zn	ppm	0.5 – 0.8
Cu	ppm	0.2 – 0.3
Ni	ppm	1.5 – 2
Hg	ppm	< 0.05
Cd	ppm	< 0.1
Pb	ppm	0.1 – 0.2
Ecotoxicity	equitox	60 - 140

7.1.1.3 The most common process used for purification of the glycerin solution consists of the evaporation of water followed by the separation of the salts

TASK 7: ENVIRONMENTAL

and the glycerol. If a higher purity (> 99%) glycerin is desired, then a distillation process must be applied as a final step.

7.1.1.4 Volatile Organic Compounds (VOCs) are a likely byproduct created during glycerin purification. The VOCs can be controlled with the implementation of standard monitoring for the presence of methanol. In addition, lowering the pre-treatment temperature of the glycerin solution will aid in lowering the VOC levels.

7.1.1.5 Excess Methanol Removal (Transesterification Section): Most of the excess methanol is separated from the product streams by flash and atmospheric distillation and is directly recycled to the transesterification unit. Excess methanol present in the wastewater stream should be recovered as much as possible.

7.1.1.6 Wastewater Settling/Flotation for Residues: A process should be incorporated into the wastewater treatment system to allow for removal of solids by allowing for settlement. In addition, a skimming or weir should be incorporated to remove any floating residues from the water to be treated. This will allow for removal of oils mixed into the wastewater either through normal process operations or spill events. This step of the process can be accomplished using filters, oil/water separators, grit chambers, skimmers, or other existing technologies.

7.1.1.7 Wastewater Neutralization: The wastewater effluent should be neutralized to a pH of between 6 and 9 prior to discharge. This can be accomplished through chemical treatment.

7.1.1.8 Wastewater Biological Treatment

An anaerobic oxidation (Anox) system is a technique which combines anaerobic and aerobic processes to treat wastewater effluent containing relatively high concentrations of biological oxygen demand (BOD) and chemical oxygen demand (COD).

An Anox-type biological treatment system is typical for treating biodiesel wastewater streams. In the Anox process, the bioreactor is divided into two sections: in one, wastewater is contacted with anaerobic bacteria in the absence of oxygen; in the other, the effluent is vigorously mixed and air is introduced (aerobic).

The anaerobic section is agitated using pump circulation, while the aerobic section is agitated using air diffuser. The two sections are further subdivided

TASK 7: ENVIRONMENTAL

into stages to provide plug flow through the reactor, which is covered and sealed with concrete slab and steel plates. A conventional secondary clarifier follows the bioreactor.

A feed of wastewater is mixed with sludge recycled from the clarifier. This combined feed enters the anaerobic section (where dissolved-oxygen content is less than 0.7 ppm). The anaerobic section is divided into two parts: a purely anaerobic zone and what is known as an anoxic zone. In the latter, wastewater is mixed with liquid recycled from the aerobic section.

After the anoxic zone, there is a conventional aerobic section in which the dissolved oxygen level is maintained in the 2-4 milligram per liter (mg/l) range. The mixed-liquor volatile suspended solids (MLVSS) are maintained in the 3000-5000 mg/l range.

The liquid passes to a conventional secondary clarifier that separates sludge from the effluent to a sludge concentration in the range of 2-4 % (weight) solids. By exposing the biology in wastewater under anaerobic and aerobic conditions, the Anox system encourages the proliferation of a type of microorganism that can take advantage of the alternating stress and growth conditions. These organisms have the ability to store energy in the form of polyphosphate chemical linkages, enabling them to withstand the alternating conditions.

7.1.1.9 Phosphate Concentration Monitoring

In the anoxic zone, the absence of dissolved oxygen and the presence of nitrates recycled from the anaerobic zone favor organisms capable of biological denitrification. Bacteria that normally use dissolved oxygen for oxidation of Biological Oxygen Demand (BOD) employ the oxygen chemically combined with nitrogen in the nitrate (NO_3) ion. Carbon from the BOD is oxidized to carbon dioxide, and nitrogen gas is formed and removed from the wastewater stream. In the aerobic section, the organisms are using the oxygen that is added to convert stored BOD to carbon dioxide, water, and additional cell mass. The excess energy from this reaction is directed to re-creating the cellular polyphosphate present in solution. Due to the growth of new cells, the amount of polyphosphate taken in by the biology is greater than the amount that was given up in the anaerobic section, thus providing net phosphate removal.

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7.1.1.10BOD Treatment

In the anaerobic section, BOD concentration is high. In the absence of oxygen, organisms have stored energy to actively transport BOD to their cell walls while they decompose stored polyphosphate to orthophosphate. The BOD of the liquid decreases while the phosphate concentration increases.

7.1.2 Glycerin Production

7.1.2.1 Residual Methanol Monitoring: In order to reduce the methanol content of gaseous effluents to minimum levels, the gases vented from the tank are sent to the scrubber where, via passage through water stream, the methanol is absorbed. The water containing methanol is then sent to methanol rectification.

7.1.2.2 Air Scrubbers: This unit consists of a vent header and a condensing/scrubbing system. The unit is designed to condense all emergency vents from the upstream production unit. All vents coming from the plant are collected in a header, sent to the condenser, and then recovered in a methanol holding tank. The methanol collected is sent through a pump to the methanol distillation unit.

7.1.3 Power Production

7.1.3.1 Air Quality Limits

Table 7.2: Air Quality Limits

Parameter	Unit	Standard (max)
- Sulfur dioxide (SO_2)	µg/Nm^3	900/hour
- Carbon monoxide (CO)	µg/Nm^3	30,000/hour
- Nitrogen dioxide (NO_2)	µg/Nm^3	400/hour
- Ozone (O_3)	µg/Nm^3	235/hour
- Hydrocarbon	µg/Nm^3	160/3-hour
- Dust (TSP)	µg/Nm^3	230/24-hour
- Lead (Pb)	µg/Nm^3	2/24-hour
- Noise	dB(A)	70

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7.1.3.2 Monitoring

Table 7.3: Monitoring Criteria

Observation	Physical Form	Source	Types	Key Parameter	Applicable Standards	Monitoring Location	Methods	Frequency	Execution
a. Liquid Effluent									
Domestic wastewater	Liquid	Bathroom, toilet, utility facilities	Polluted surface water, and water well	Quality	Kep-51/MNLH/10/1995	Discharge outlet of wastewater effluent to drainage system, septic tank	Laboratory analysis	Every 6 months	Operation
b. Solid Waste									
1. Domestic & process non-hazardous	Plastics, paper, cartoon, pallet, etc.	Production areas, store and office activities	Lower earth quality, health problem, less aesthetics	Quantity and types of waste	Perda No. 5 Tahun 2001	Domestic and hazardous waste disposal areas	Visual (quality, quantity, and types of waste	Every month	Operation
2. Used bleaching earth	Earth/ Powder	Production areas	Lower earth quality, health problem, less aesthetics	Quantity and types of waste	- Perda No. 5 Tahun 2001 - PP No. 85 Tahun 1999	Used bleaching earth disposal areas	Visual (quality, quantity, and types of waste)	Every month	Operation
c. Air Venting									
1. Gas - external (ambient)	Gas	Area around the plant	Lack of quality air	Quality	Peraturan Pemerintah No 41 Tahun 1999	Plant areas and surrounding	Laboratory analysis	Every 6 months	Operation
2. Dust - internal (ambient)	Particles	Area around the plant	Lack of quality air	Quality	Peraturan Pemerintah No 41 Tahun 1999	Plant areas and surrounding	Laboratory analysis	Every 6 months	Operation
d. Noise									
- External (ambient)	Sound intensity (noise level)	Production process facilities	Hearing distortion	Quality	Men LH No. Kep-48/MNLH/11/1996	Plant areas and surrounding	Laboratory analysis	Every 6 months	Operation

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7.2 AIR QUALITY IMPACT

Biodiesel reduces a number of other emissions in addition to greenhouse gases. The following data are based on 1998 study results by the National Renewable Energy Laboratory (NREL):

- Compared to conventional diesel, CO and particulate matter emissions are reduced by one-third.
- SOx emissions decreased by 8% on a lifecycle basis; additionally, tailpipe SOx emissions are completely eliminated because biodiesel does not contain sulfur.
  As the underlying study used the U.S. background power mix and assumed very high energy consumption for the production process, the SOx emission reduction for Canadian biodiesel production would probably be more significant.
- NOx emissions increased by about 13% (biodiesel exhaust has a higher NOx content than conventional diesel). This result is disputed by another study (IEA 1994), which found no such increase if the engine is correctly tuned, but is confirmed by another American study [EPA 2002].
- Hydrocarbon emissions rise by about one-third.

If biodiesel is made from energy crops, additional environmental impacts can be expected from agriculture, such as eutrophication of groundwater or surface waters, water consumption for irrigation, the use of pesticides, etc. The German IFEU Institute compared various environmental impacts of biodiesel production to the use of conventional diesel and came to the conclusion that the impacts are significant for both products, such that it is a political, not an environmental, question as to which fuel should be preferred.
The energy balance of biodiesel is better than that of conventional diesel, reflected in savings equivalent to the energy required to make 8 litres of conventional diesel per 100 km. Likewise, GHG emissions are reduced. However, emissions causing acidification, eutrophication, and ozone-depleting substances are far greater, to an equivalent of 119 litres per 100 km in the case of ozone depletion. These emissions are caused by microbial activity that releases part of the fertilizer used to grow canola into the air as nitrous oxide (N_2O), which is an ozone-depleting substance, as well as a GHG. 50% of the IPPC guidance value for N_2O emissions from fertilizer were used by IFEU, based on fertilizer application of 180 kg N/ha [IFEU 2003, p.10].

7.2.1 Air Quality Impact for Bio/Petroleum Diesel Blends

Table 7.4: Air Quality Impact for Biodiesel Fuel

Type of Biodiesel Fuel	NOx	CO	VOC
B 20	+ 2.4%	- 13.1%	- 17.9%
B 100	+ 13.2 %	- 42.7%	- 63.2%

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Biodiesel is renewable and does not directly contribute to global warming due to its closed carbon cycle. The primary feedstock for biodiesel is a biologically based oil or fat, which can be grown season after season. Since the carbon in the fuel is removed from the air by plants, there is no net increase in carbon dioxide levels.

Biodiesel is a renewable and clean fuel (vegetable fuel), which helps preserve the environment due to the use of vegetable oils as a raw material. Biodiesel contains no petroleum, but it can be blended at any level with petroleum diesel to create a biodiesel blend.

Biodiesel can be used in compression-ignition (diesel) engines with little or no modifications. Biodiesel is simple to use, biodegradable, non-toxic, and essentially free of sulfur and aromatics. Biodiesel is used widely all over Europe, although much more development is needed in order to comply with the objectives fixed by the biofuels directive.

Transport is one of the most energy-demanding sectors, consuming about 30% of the world's overall energy; this percentage reaches 32% in Europe and 40% in some countries. That consumption is focused mainly toward petroleum derivatives, which are a decreasing resource, located in politically unstable countries, and a contributor to the greenhouse effect.

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7.2.2 Greenhouse Gas Reduction

20% Biodiesel Blend (B20)

The B20 blend is a common higher-ratio blend that is used in the United States. Lower-ratio blends include 1% (B1) and 2% (B2). It offers some significant benefits in terms of exhaust emissions and greenhouse gas benefits. The lifecycle GHG emissions for the three biodiesel fuels and conventional petroleum diesel are indicated in Table 7.5. The reductions in greenhouse gas emissions range from 10% to 17.3%. Rapeseed and soy biodiesel performance are indicated based on well-documented data. Palm oil biodiesel is not as thoroughly researched, but anticipated to perform similarly to rapeseed and soy from a GHG emissions standpoint.

Table 7.5: Lifecycle GHG Emissions for 20% Biodiesel

	Diesel Fuel	Biodiesel (Rape)	Biodiesel (Soy)	Biodiesel (Animal Fat)
(1 mile = 1,609.3 m)	G/mile	G/mile	G/mile	G/mile
Vehicle operation	7,701.5	1,696.0	1,696.0	1,696.0
C in end-use fuel from Co2 in air	0	(1,673.0)	(1,673.0)	(1,673.0)
Net vehicle operation	7,701.5	23.0	23.0	23.0
Fuel dispensing	2.4	2.6	2.6	2.6
Fuel storage and distribution	27.8	36.3	31.6	31.6
Fuel production	183.0	244.2	337.2	581.3
Feedstock transport	4.6	26.5	58.4	50.7
Feedstock & fertilizer production	233.3	622.3	774.9	0.0
Land use changes and cultivation	0	409.2	1,899.4	0.0
Ch4 and CO2 leaks and flares	71.1	0.0	0.0	0.0
C in end-use fuel from CO2 in air	0	(1,673.0)	(1,673.0)	(1,673.0)
Emissions displaced by co-products	0.0	(630.9)	(2,379.2)	(603.2)
Subtotal (fuel cycle)	2,223.7	73.1	748.0	86.1
% changes (fuel cycle)	-	- 67.0	- 66.4	- 96.1
Vehicle assembly and transport	19.1	22.9	22.9	22.9
Materials in vehicles	69.6	82.4	82.4	82.4
Grand total	2,312.4	838.4	853.3	191.4
% changes (grand total)	-	- 63.7	- 63.7	- 63.7

100% Biodiesel (B100)
The approach of using pure biodiesel (B100) maximizes the environmental benefits, but also creates the largest issues for engine manufacturer acceptance of the fuel and the cold weather properties. Greenhouse gas reductions range from 51.1% for soy biodiesel to 88.9% for tallow biodiesel.

Table 7.6: Lifecycle GHG Emissions for 100% Biodiesel

	Diesel Fuel	Biodiesel (Rape)	Biodiesel (Soy)	Biodiesel (Animal Fat)
(1 mile = 1,609.3 m)	G/mile	G/mile	G/mile	G/mile
Vehicle operation	7,701.5	1,696.0	1,696.0	1,696.0
C in end-use fuel from CO_2 in air	0	(1,673.0)	(1,673.0)	(1,673.0)
Net vehicle operation	7,701.5	23.0	23.0	23.0
Fuel dispensing	2.4	2.6	2.6	2.6
Fuel storage and distribution	27.8	36.3	31.6	31.6
Fuel production	183.0	244.2	337.2	581.3
Feedstock transport	4.6	26.5	58.4	50.7
Feedstock & fertilizer production	233.3	622.3	774.9	0.0
Land use changes and cultivation	0	409.2	1,899.4	0.0
CH_4 and CO_2 leaks and flares	71.1	0.0	0.0	0.0
C in end-use fuel from CO_2 in air	0	(1,673.0)	(1,673.0)	(1,673.0)
Emissions displaced by co-products	0.0	(630.9)	(2,379.2)	(603.2)
Subtotal (fuel cycle)	2,223.7	73.1	748.0	86.1
% changes (fuel cycle)	-	- 67.0	- 66.4	- 96.1
Vehicle assembly and transport	19.1	22.9	22.9	22.9
Materials in vehicles	69.6	82.4	82.4	82.4
Grand total	2,312.4	838.4	853.3	191.4
% changes (grand total)	-	- 63.7	- 63.1	- 91.7

7.3 WASTE DISPOSAL

7.3.1 Palm Oil Waste as Fuel

Palm fruit creates solid waste (shell, fiber, empty fruit bunches) after being processed for oil extraction. In previous technologies, this solid waste, including effluents, was primarily incinerated in an open system in order to reduce the handling of waste and produce ash used for fertilization of the plantation. This biomass is a potential source of renewable energy that has yet to be employed efficiently. Intensive use of biomass as a renewable energy source could reduce dependency on fossil fuels, while overall reduction of net carbon dioxide emissions to atmosphere will in turn mitigate the greenhouse effect. The current technology will handle the waste as a fuel source in order to generate power for the PLN grid. Approximately 371,000 MT per year of biomass waste will be utilized as fuel in order to provide process steam to the biodiesel production facility and generate 7.95 MW of power to support the existing PLN power grid. The resultant ash generated will be returned to the plantation as potassium-enriched fertilizer for the existing palm trees. Emissions produced by the furnace will be in the form of synthetic gases and can be controlled by complete combustion within the furnace chamber. The ultimate goal will be to utilize palm oil waste in order to have near zero waste production within the production facilities.

7.3.2 Impact on Water, Land, Forests, and Habitats

Currently, the PTPN-III plantation statistics state that 96,858.14 hectares of land is occupied by palm oil trees. An additional 6,566.56 hectares has already been reserved and prepared for expanding the total crop lands to 103,424.70 hectares. Since there will be no need for any additional land clearing in order to bring the facility into production, significant impacts on the local habitats and lands will not be incurred.

The existing facility contains retention ponds and can employ the use of Riparian reserves to minimize soil runoff and serve as a filtration system to preserve water quality entering rivers.

Trees of between 5 and 20 years in age produce the highest amount palm fruit available for harvest. Trees above 20 years maintain the ability to produce viable palm fruit, but are generally difficult to harvest due to the immense height of the trunk. These trees are usually replaced with seedlings to reinitiate plantation sustainability. A "zero burning" planting technique can be employed to return valuable lost nutrients to the soil. This technology is a practice in which the uneconomical crop trees are knocked down, shredded, and left to decompose in place of the original tree. This technique also ensures that all plant tissues are recycled, which enhance soil organic matter. It will perpetually help to restore and improve soil fertility and reduce the input of inorganic fertilizers. The return of organic matter also improves the physical and chemical properties of the soil. When compared to the practice of the clear-cutting method in which the older trees are burned or chopped and removed, the zero burning technique allows replanting to make a non-polluting, positive contribution toward minimizing global warming.

A potential drawback to the zero burning technique is the potential influx of the rhinoceros beetle, *Oryctes rhinoceros*. These insects are drawn to the presence of large quantities of decomposing biomass, which are ideal breeding grounds of the pest. As a deterrent, shredding of plant tissues and early establishment of leguminous cover crops over the grounds can significantly reduce viability of breeding sites. In addition, compact stacking of plant debris in close-ended trenches can further reduce beetle outbreaks due to the debris becoming waterlogged, in turn making the area unsuitable for *Oryctes* to breed.

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7.3.3 Greenhouse Gas Reduction

The palm oil industry in Indonesia is affected by economic development and by emerging technologies, population, and societal choices. A challenge arises when the increasing demand for energy upsets existing emissions standards intended to reduce the rate of growth of greenhouse gas emissions. As supplies of fossil fuels are depleted, renewable energy sources are increasingly sought after. Palm biomass waste, therefore, has a twofold benefit of producing power while also contributing to the reduction of greenhouse gases.

The biodiesel production facility is dependent on steam supplied by the waste-to-energy plant. In order to generate enough steam to feed the process and drive the turbine generator set, biomass waste is utilized as fuel for the furnace. The amount of greenhouse gas emissions released during the entire production process depends on the type of technology employed for biomass incineration.

7.3.3.1 Carbon Emissions from Biomass Waste-to-Energy Plant

The proposed activity consists of a 9.8-MW installed capacity generator with boiler, which will directly reduce greenhouse gas emissions from future generation of electricity and steam production that would normally use fossil fuels for thermal generation. Under the baseline scenario there would be continued use of diesel generation to provide both electricity and steam to industrial, commercial, and residential consumers within the complex. The project will displace the use of diesel for electricity and steam generation with a carbon neutral alternative, EFB. The project will result in some emissions from the use of diesel generators during an annual maintenance period.

The emissions from biomass combustion include the products from complete combustion (carbon dioxide) and incomplete combustion (carbon monoxide, char particles, tar, polycyclic aromatic hydrocarbons, and other organic compounds). Emissions for nitrous oxide, sulfur dioxide, hydrochloric acid, and ash particles are also affected by the fuel properties and operating conditions. Tables 7.7 and 7.8 list the proximate and ultimate analyses of oil palm shell waste and EFB which are taken into consideration for optimal incineration.

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Table 7.7: Proximate Analysis of Oil Palm Shell Waste and EFB Waste				
Fuel	Proximate Analysis %			
	Moisture	Volatile	Fixed Carbon	Ash
Palm Shell Waste	9.7	67	21.2	2.1
EFB Waste	6.8	77.4	19.3	3.3

Source: *Hussain Thermochemical Behaviour of Empty Fruit Bunches and Oil Palm Shell Waste in a Circulating Fluidized-Bed Combustor (CFBC) p. 210–218.*

Table 7.8: Ultimate Analysis of Oil Palm Shell Waste and EFB Waste						
Fuel	Ultimate Analysis %					
	C	H	N	O	S	Cl
Palm Shell Waste	47.62	6.20	0.70	43.38	-	-
EFB Waste	49.50	5.90	0.50	40.60	0.10	0.20

Source: *Hussain Thermochemical Behaviour of Empty Fruit Bunches and Oil Palm Shell Waste in a Circulating Fluidized-Bed Combustor (CFBC) p. 210–218.*

A two-stage burner system allows primary air to be introduced to the initial fuel mix in order to begin the combustion reaction. Excess combustible gases and volatiles are released into the combustion chamber where secondary air is added in order to completely burn the synthesis gases such as CO and H_2 produced by gasification.

According to Hussain et. al., the combustion of 100% EFB produced a stack gas which consisted of hydrogen, carbon monoxide, and methane (Table 7.9). It was found that the concentrations of hydrogen and methane increased as the internal furnace temperature exceeded 650°C. Emissions produced by the combustion of various sizes of palm shell particles depended on the primary air flow. As the primary air flow was increased, the carbon monoxide concentration would also increase due to particle size and low residence time in the furnace. The resulting airborne emission appeared as a thick white smoke cloud indicating incomplete combustion and excess carbon monoxide formation.

Table 7.9: Emissions of 100% Combustion of EFB Waste	
Emission Components	Concentration %
Hydrogen (H_2)	5
Carbon Monoxide (CO)	10
Methane (CH_4)	Several
Other Hydrocarbons (HC)	Trace

Source: *Hussain Thermochemical Behaviour of Empty Fruit Bunches and Oil Palm Shell Waste in a Circulating Fluidized-Bed Combustor (CFBC) p. 210–218.*

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Electricity will be co-generated in the biomass waste-to-energy plant and will displace the need for coal-fired power within the facility. The net greenhouse gas reduction from biomass combustion can be greater than 100% when compared to its coal-fired counterpart because carbon dioxide that is absorbed during the growth of feedstock can be greater than the actual carbon dioxide emissions from the stack.

New power plants are needed to satisfy the ever-growing demand of electricity energy in the surrounding area. Conventional power plants run on fossil fuels and have significant environmental impacts, particularly in handling liquid waste and pollutants. This renewable energy project will provide 10.3 MW of electricity and offset the requirement for diesel generation. The carbon dioxide emission of the latter technology is 0.87 $kgCO_2/kWh$.

Burning coal produces about 9 billion tonnes of carbon dioxide each year which is released to the atmosphere, about 70% of this being from power generation. Other estimates put carbon dioxide emissions from power generation at one-third of the world total of over 25 billion tonnes of CO_2 emissions.

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7.4 BIODIESEL CERTIFICATION TECHNIQUES

7.4.1 Requirements of International Energy Agency (IEA)

In 2002 the US Environmental Protection Agency (EPA) published a fact sheet on biodiesel. The EPA noted that the actual emission impact of the use of biodiesel varies from engine to engine. A summary of the emissions impact, relative to fossil diesel fuel, for B20 and B100 for an engine that takes full advantage of the fuel's clean burning properties are shown in the following table.

Table 7.10: EPA Emission Assessment (B100, B20 compared to fossil fuel)

Parameter	B100	B20
- Carbon monoxide	- 50%	- 10%
- Particulate matter	- 70%	- 15%
- Total hydrocarbons	- 40%	- 10%
- Sulfate emissions	- 100%	- 20%
- Nitrogen oxides	+ 9%	+ 2%
- Methane	No change	No change

NOx can increase with the use of biodiesel. The reason for the NOx increase is still an area of active research, but it is at least partially due to injection timing advances associated with property differences between biodiesel and petroleum. A substantial reduction of NOx (up to -23 %) can be achieved by a 5° delayed injection adjustment.

7.4.2 Requirements of World Wildlife Fund (WWF)

The WWF has published practices for biodiversity and ecosystem impact analysis of new projects and ongoing risk management and monitoring. The PTPN-III biodiesel project has a minimal impact on biodiversity and ecosystem because the facility is being constructed at a production-scale plantation and palm oil mill. This project does not require forest clearing or other natural resource alterations. PTPN-III will implement monitoring according to Section 7.1 of this report.

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7.4.3 Requirements of Roundtable on Sustainable Palm Oil (RSPO)

RSPO publishes a guidance document titled *RSPO Principles and Criteria for Sustainable Palm Oil Production (October 2007)* which indicates environmental impact and sustainability criteria. The document is available from the RSPO website and also by contacting the RSPO office. The cropping rotation plan, emissions and effluent controls, and POME treatment as programmed in this report generally meet the criteria set forth by RSPO. Prime Engineering, Inc. recommends that the RSPO document become a part of the Engineering, Procurement, and Construction (EPC) contract documents so that the EPC contractor and technology licensor are obligated to demonstrate plant performance in compliance with the criteria.

7.4.4 Recommended Certification Plan

The aforementioned agencies do not practice a formal biodiesel certification process because there is still discussion in the sector on physical properties and blend characteristics. Prime Engineering recommends the following two approaches to certifying biodiesel produced by PTPN-III:

7.4.4.1 Compliance with ASTM D6751 and EN 14214

Tables 1.10 and 1.11 in Section 1 of this report indicate physical property parameters for methylester to be considered biodiesel. All of the biodiesel process technologies that we have evaluated guarantee product performance meeting ASTM and EN standards. Additionally, PTPN-III will additionally verify compliance with these standards with a Quality Control analytical laboratory and qualified analytical chemist and technician staff.

7.4.4.2 Compliance with BQ-9000

There is currently only one biodiesel certification program: the BQ-9000 voluntary Biodiesel Accreditation Program. The BQ-9000 National Biodiesel Accreditation Program combines certification showing compliance with the ASTM D6751 standard with a quality systems program encompassing all stages of the biodiesel manufacture and supply process, including storage, sampling, blending, testing, shipping, and distribution.

PTPN-III would be qualified to apply to the BQ-9000 accreditation program as a "BQ-9000 Producer." Program certification is conducted by an initial auditor who reviews PTPN-III's quality monitoring systems including sampling, testing, storage, retain samples, and shipping. The initial certification is valid for a period of three years and PTPN-III would undergo a recertification audit every two years after. The certification process is

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comprehensive, in a similar manner to ISO-9000 certification, and includes a detailed review of quality system documentation and conformance with the documentation.

BQ-9000 certification costs include a US$1,000 application fee and an audit fee of US$2,000 plus auditor travel expenses. Each recertification fee is US$2,000 plus auditor travel expenses.

Contact information for the National Biodiesel Accreditation Program is:

NBAC
P.O. Box 104898
Jefferson City, Missouri 65110
U.S.A.

Telephone: +1-573-635-3893
E-mail: info@bq-9000.org
Website: www.BQ-9000.org

TASK 8: IMPLEMENTATION PLAN

SECTION 8 – IMPLEMENTATION PLAN (TASK 8)

8.1 IMPLEMENTATION PLAN

8.1.1 PTPN-III's Project Management Plan

Planning and implementation will be administered by PTPN-III's Planning and Business Development function. The executive and management team consists of the following individuals:

Ir. Amri Siregar – Direktur Utama (Chief Executive Officer)
Dr. Chairul Muluk – Director for Planning and Business Development
Dr. Krishna Surya Bhuana – Director of Projects

8.1.2 Biodiesel Offtake Contract

There is currently no legal restriction on the offtake of biofuel in Indonesia. As such, PTPN-III would be free to negotiate a sales agreement with any purchaser, either domestic or foreign, government owned or privately operated. The decision by PTPN-III on how much biofuel to sell, in which market, and to what buyer is purely commercial in nature. Factors limiting such decisions are only current market conditions and overall company objectives.

In the event the event PTPN-III wishes to export its biofuel product, then the two step process, stated below, will need to be followed (along with the documents required for submission) in order to obtain an Export License.

1. Recommendation from Minister of Energy and Mineral Resources
   - Application for Recommendation
   - Biofuel Permit

2. Export License from Department of Trade
   - Biofuel Permit
   - Company Registration (TDP)
   - Tax Payer Number (NPWP)

8.1.2.1 Relevant Regulations

- Regulation of Minister of Energy and Mineral Resources No.051 Tahun 2006 regarding the requirements and procedures obtaining a biofuel permit

- Decree of Minister of Trade No.558/MPP/Kep/12/1998 regarding General provision in export activities

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8.1.3 Power Purchase Agreement

8.1.3.1 General Overview of Indonesian Electricity Law

- Electricity May Not be Sold Directly to the Consumer
  - In general electricity supply operations in Indonesia are carried out by the State through state-owned companies established for this specific purpose. (Article 7, par. 1, Law 15/1985; See also Minister of Energy Regulation 1 of 2006) The current state-owned electric company is PLN.
  - However, in order to increase the Government's ability to meet the demand for electricity private parties (IPP) may be granted an Electricity Business Operation License to supply electricity to PLN. (Article 7, par. 2, Law 15/1985; See also Minister of Energy Regulation 1 of 2006)
  - In addition, excess electricity from power plants built by the owner for its own use may be sold to PLN, and if such excess is generated from a renewable energy source and between 1 MW and 10 MW, then PLN must purchase the electricity. (Par 2-3, Min. Reg. 2 of 2006).

8.1.3.2 Laws Related to Power Purchase Agreement (PPA)

- Electricity Sold by Contract (PPA) to PLN
  - Electricity shall be sold through a sales contract, or Power Purchase Agreement (PPA). (Article 3, par 4, 5, Pres Decree No. 37 of 1992; See also Minister of Energy Regulation 1 of 2006)
- Duration of PPA
  - Under Ministry Regulation 2 of 2006, the PPA for small scale renewable projects (Under 10MW capacity) the PPA shall be at least 10 years with an option to extend. (Article 6, par. 3, Min. Reg 2 of 2006)
- Sale Price for Electricity in PPA
  - The purchase price may be stated in Rupiah or foreign currency (US$) (see Article 32A, par. 1, Pres. Reg. No. 26 of 2006) and in fact

TASK 8: IMPLEMENTATION PLAN

usually contains several components rather than a single price. The capital recovery component is usually US$ denominated.

- Special prices have been set by Ministerial decree for small scale renewable energy projects (under 10MW capacity). By law the tariff is to be equal to 80% of the PLN generating cost (known as the BPP) on the grid to which the IPP project is connected. (see Article 3, par. 1, Min. Reg. No. 2 of 2006)

- For the North Sumatera grid, the BPP (cost of generating electricity) is currently IDR 1,891/kWh. This means that 80% of this BPP, and the tariff PTPN-III should expect for this project, is IDR 1,512.8/kWh. (see Min. Decree 269 of 2008).

- This price will be fixed for the first three years of the PPA, and then each year thereafter the tariff will be adjusted to reflect 80% of the then current BPP for the North Sumatera grid. (see Article 6, par. 4, Min. Reg. 2 of 2006)

- <u>Transmission Line Costs are Charged to the Community by PLN</u>

  - Both PLN and the IPP must provide electrical power connections in their working area. (Article 29, Pres. Reg. 10 of 1989) The IPP working area is the power plant facility including the interconnection point. The PLN working area is the region in which they are responsible for the provision and distribution of electricity to the public.

  - The cost of any transmission line is to be paid by the members of the public needing electrical power. (Article 30, Pres. Reg. 10 of 1989)

  - The transmission line cost shall include the total cost of constructing an electrical power connection between the last point of supply (the interconnection point) and the first point of use (PLN substation). (Article 30, Elucidation, Pres. Reg. 10 of 1989)

- <u>Tax Facilities granted to IPP Projects</u>

  - IPP Projects are granted several important tax facilities including—(1) exemption of import duty on capital goods; (2) VAT suspended; and (3) sales tax on luxury goods shall not apply. (Article 6, par 1, Pres Decree No. 37 of 1992)

TASK 8: IMPLEMENTATION PLAN

8.1.3.3 Licensing Process (See Article 5-6, Min Reg. 2 of 2006)

- Electricity License Procedures

    - PTPN-III will need to submit an offer to the local PLN with copies to the Director General, Governor, or Regent/Mayor in accordance with their respective competencies in granting permits.

    - The documentation for the offer contemplated in paragraph 8.1.3.1 must be complete with the following required administrative and technical documents:

        Administrative
        - Applicant's identity
        - Company's deed of incorporation
        - Company profile
        - Taxpayer's Index Number (NPWP)
        - Funding capability

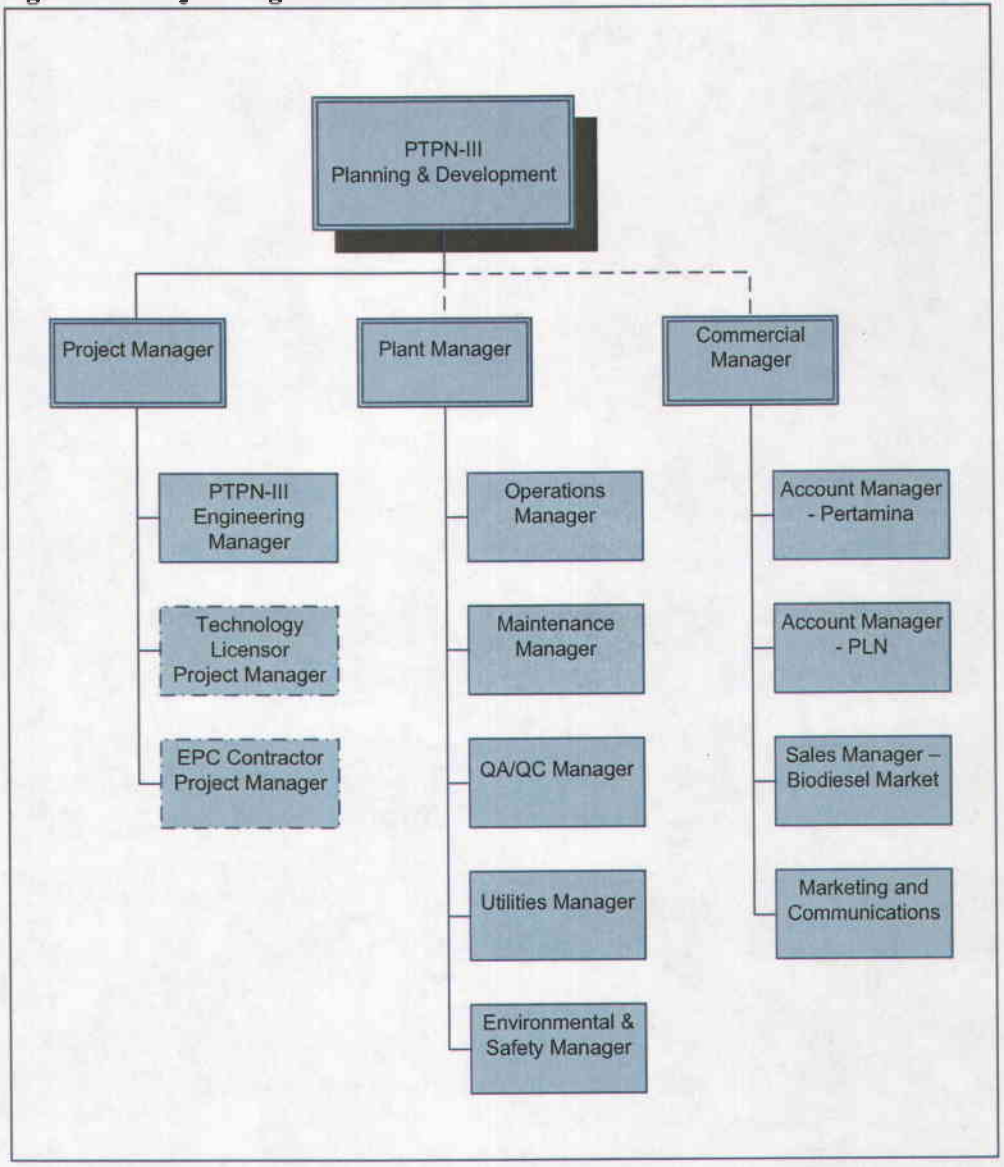
        Technical
        - Feasibility study
        - Environmental Management Endeavour and Environmental Monitoring Endeavour documents in accordance with the provisions of statutory regulations
        - Schedule for construction and operating plans
        - Site Plan illustrating the location of the generator and the nearest PKUK or PIUKU network
        - Detailed designs of the generator and specifications of the equipment to be used, including the interconnection with the PKUK or PIUKU system
        - The purchasing of electrical power contemplated in paragraph 8.1.3.1 and the signing of the contract for the sale and purchase of electrical power must be implemented in a period of not more than 90 (ninety) days from when the complete offer documents are received.

        Water Rights
        - Must be negotiated with the local bupati as per Presidential Regulation Number 42 of 2008 dated 23 May 2008

        Land Use Permits/Acquisition Contracts
        - By law holders of title to land must make their land available to either PLN or an IPP who is a holder of an Electricity

TASK 8: IMPLEMENTATION PLAN

Figure 8.1. Project Organization Chart.



TASK 8: IMPLEMENTATION PLAN

8.2 TRAINING NEEDS ASSESSMENT

8.2.1 Project Development Training Needs

8.2.1.1 Project Team Alignment

The Construction Industry Institute (CII) is a North American collaboration of engineering, construction, and management professionals who publish capital project implementation best practices for construction projects in the industrial sector.

"Project Team Alignment" is defined by the CII as "appropriate project participants working within acceptable tolerances to develop and meet a uniformly defined and understood set of project objectives."

Whenever a project planning team is formed with people from different function groups, each team member brings the values and goals of their specific function group. These values and goals sometimes conflict with the those from other functional groups or with the organization's overall project goals. Aligning the team involves developing clearly understood objectives for all team members and gaining the commitment to work toward those goals. At the end of the alignment process, each member is focused on the same set of project objectives.

ROLES AND RELATIONSHIPS DEFINITIONS:

- **Sponsor:** Individual responsible for providing resources for the project; the customer
- **Stakeholders**: Individuals who can influence or are affected by the project outcome
- **Deliverable:** Fundamental project requirements ("needs and "must-haves")
- **Expectation:** Desirable project features ("wants" and "nice-to-haves")
- **Critical Success Factors:** Action items identified by the team that enable the programming of the project to address all deliverables and expectations

ALIGNMENT MEETING:

A project "team alignment" meeting is conducted prior to the execution phase of the project. It is crucial that a qualified team alignment facilitator leads the meeting and prepares the agenda and objectives prior to the meeting date. The team alignment meeting enables the following discussions:

TASK 8: IMPLEMENTATION PLAN

- Allow team to understand them; don't work them
- Allow sponsor and team to decide if item is a deliverable or expectation
- List wants separately as they come up
- Ensure all questions are asked – silence does not mean acceptance

Goals—At the conclusion of the Team Alignment meeting, the team will have:

- A clear understanding of the project objectives and schedule
- An action plan to develop the program facility and functional requirements
- A communication and approval process to lock in scope elements

ALIGNMENT MEETING PROCESS (FDOORA):

For conducting alignment meetings, CII recommends a structured format known as "FDOORA." The alignment facilitator ensures that the alignment meeting follows the process for the best results. "FDOORA" stands for:

Form

This is the first step in the kickoff process, where the project team members convene for the first time. It is highly recommended that this meeting be facilitated by someone other than a project stakeholder.

The facilitator should lead the group in forming basic ground rules and behaviors that will be followed throughout the project lifecycle. At this meeting, the project team organizational chart is introduced; roles and responsibilities are refined, and channels of communication are identified. Additionally, the design review and approval process is explained.

Direction

During this stage, the team formulates or refines its mission, goals, and objectives. The focus should be on hard results and Critical Success Factors.

Project members should create a mission statement and goals for the team using the deliverables and expectations. The mission should be no more than two sentences and should communicate the purpose of the team and desired outcome of the project. The mission can be created by the team leader after the alignment meeting if time does not allow. The mission should be finalized and sent to each team member prior to commencement of the first project meeting.

TASK 8: IMPLEMENTATION PLAN

Organization

This stage begins with a review of the list of deliverables and expectations. The project team then brainstorms to determine Critical Success Factors (CSF). Using a flip chart or white board, the meeting facilitator quickly writes each CSF, leaving room under each CSF to identify the team members who will be involved in completing that CSF. It is important that the team does not begin work on deliverables during this stage. This stage should be used for brainstorming only. After the meeting, the list of Critical Success Factors is typed into a table format and distributed to the team members.

Action plans are formulated for each CSF according to the "RACI" structure. The RACI structure is defined as:

R = Responsible	Individual tasked with leading the CSF action plan
A = Accountable	Manager or stakeholder to whom the "R" individual is accountable in the leadership structure of the team or company
C = Consult	Any individual identified who may contribute to accomplishing the task
I = Inform	Individuals or stakeholders who need to be informed of the results of the CSF action plan

The CSF table shows what must be done to meet each deliverable and expectation and is used to develop the execution plan. Additional CSFs can be added or removed during the project lifecycle. The table will include the following assignments:

- A's must reside with team members
- R's are who they will need to work with to complete task
- R's can also be other(s) that will do the task
- T's (action plant Timing) based on keeping the project moving through the process
- T's can reference milestones in the master schedule

Once the CSFs have been defined, the team begins developing the execution plan. The project leader should assign next steps to team members, with timing, prior to beginning the next stage of the alignment process.

TASK 8: IMPLEMENTATION PLAN

Additionally, the project leader should take time to make sure everyone is comfortable with the items listed and understands their role and responsibilities.

Operations

During this stage, the team members choose a format for future meetings and decide on each meeting's location, frequency, schedule, and length. The meeting time and frequency should not be changed unless absolutely necessary.

Future meetings will be facilitated by members of the project team. At this point, team members will either appoint the meeting facilitator or choose to take turns facilitating the meetings. The meeting facilitator will be responsible for publishing the agenda prior to each team meeting and assigning a team member to take minutes.

Once the meetings have been agreed upon, the team should build the agenda for the first meeting, finalize mission and goals, and review the most urgent CSFs. Ground rules should be reviewed before moving on to the next stage and should always be available at each meeting.

Relationship

Project teams often include members from different departments who have no history of working together. Project team members may not understand everyone's role in the project and may even view each other as adversaries. This condition fosters an environment of conflict and distrust.

The project leadership has a tremendous amount of influence on team culture. During the pre-project planning stage, the meeting facilitator should focus on promoting trust, honesty, and open dialogue.

Assessment

The success of the team alignment and project outcome should be measured periodically by the group. During this stage, the team should agree on a self-assessment method to evaluate how the team is functioning.

TASK 8: IMPLEMENTATION PLAN

8.2.2 Biodiesel Manufacturing Training Needs

8.2.2.1 Operations Training

The technology licensor shall provide the following operations training:

- Engineering Training Phase 1: The technology licensor shall provide a three- to five-day training session to the PTPN-III project management and engineering team. The purpose of this training session is to familiarize the technical and operations professional staff with the technology and the design process. The training shall be conducted after Front-End Engineering but prior to the start of Detailed Design.

- Operations Training Phase 1: The technology licensor shall provide a two- to three-day classroom training session to the operations team, including professional and labor staff. The classroom training session will introduce the biodiesel manufacturing process as well as basic environmental, safety, and health guidelines.

- Operations Training Phase 2: Prior to the commissioning of the plant, but after mechanical completion, the technology licensor shall provide a comprehensive tour of the plant to the operations professional and labor staff. The purpose of this one- to two-day session is to thoroughly identify key equipment locations and controls and to match physical locations of the process with their schematic representations on the Piping and Instrumentation Diagrams (P&IDs).

- Engineering Training Phase 2: The technology licensor shall provide on-the-job operations training to the engineering and professional staff prior to and during the performance demonstration period. The purpose of this training is to properly tune control loops and to instruct the PTPN-III staff on troubleshooting and analysis techniques.

8.2.2.2 Maintenance Training

The technology licensor shall provide Preventive Maintenance (PM) training to PTPN-III's maintenance manager and superintendant staff.

TASK 8: IMPLEMENTATION PLAN

8.3 PRESENTATION DISCUSSION POINTS

8.3.1 Commercial Banks

This report presents the feasibility and commercial basis of the project and may be considered an indicator of project bankability. Commercial banks will review the report contents in their attempt to thoroughly analyze the credit strength of PTPN-III and the project. The primary aspects of the project that are of interest to most commercial banks are:

- Corporate Structure: Typical project finance loans are granted to separate legal entities known as Project Special Purpose Vehicles (SPVs). The purpose of the SPV is to limit recourse to the assets and future cash flows of the project and not the sponsoring company (PTPN-III in this case).

- Debt Service Securitization: PTPN-III's current CPO business can be used as security for debt repayment.

- Offtakes: Terms of the Pertamina biodiesel offtake agreement and the PLN power purchase agreement are critical for creditworthiness of the project. This feasibility study report provides indicative offtake terms; however, PTPN-III will provide authorized offtake contracts upon formal loan request.

- Debt Service Coverage: The financial ratios and covenants indicated in Section 4 of this report are strong and indicate reliable debt repayment.

- Compliance with Equator Principles: Equator Principles are a voluntary Environmental and Development Impact mandate adopted by over 40 commercial banks in the project finance sector. Section 6 (Developmental Impact) and Section 7 (Environmental) of this report outline the developmental and environmental impact criteria of the project. The criteria outlined for the project are based on World Bank criteria, which are the basis of the Equator Principles.

8.3.2 Multilateral Development Banks

The PTPN-III project would be categorized as a private-sector project by multilateral development banks. The Asian Development Bank (ADB) or International Finance Corporation (IFC), the private-sector division of the World Bank, may provide loan facilities or credit enhancement through guarantees upon their determination that the project aligns with their mandates.

TASK 9: US SOURCES OF SUPPLY

SECTION 9 – U.S. SOURCES OF SUPPLY (TASK 9)

Table 9.1: U.S. Suppliers of Goods and Services

Equipment/Service	Application	U.S. Suppliers	Contact Information
CPO Mill Section			
Belt Conveyor	Transfer FFB to process	Hi-Line Industries II	1208 Industrial Blvd. P.O. Box 673 Brenham, TX 77834 Tel: (979) 836-2661 Fax: (979) 830-8557
Bin Feeder	Supply FFB to press	Hastik-Baymont, Inc.	P.O. Box 266657 Houston, TX 77207 Tel: (713) 661-1177 Fax: (713) 661-3681 Sales Email: jerry@hastikbaymont.com
Screw Press	Extract CPO from FFB	Vincent Corporation	2810 East 5th Ave Tampa, Florida 33605 Phone: (813) 248 2650 Fax: (813) 247 7557
Degumming Tank		Alfa Laval Inc.	5400 International Trade Drive Richmond, VA 23231 United States Phone: +1 804 222 5300
Mixer	Agitation in Vessels	Lightnin- Hastik Baymont	2525 West Bellfort, Suite 200 P.O. Box 266657 Houston, TX 77207-6657 Tel: (713) 661-1177
Supply Pump	Supply CPO to process	Flowserve	5215 N. O'Connor Blvd., Suite 2300 Irving, TX 75039 Phone: (972) 443-6500 Fax: (972) 443-6800
Filter - Solids		Vincent Corporation	2810 East 5th Ave

TASK 9: US SOURCES OF SUPPLY

			Tampa, Florida 33605, U.S.A. Phone: (813) 248 2650 Fax: (813) 247 7557
Refining Section			
Oil Dryer Buffer Tank	By technology licenser	Note 1	
Oil/Oil Heat Exchanger	By technology licenser	Note 1	
Acid Dosing Unit	By technology licenser	Note 1	
Acid Mixer	By technology licenser	Note 1	
Acid Degumming Reactor	By technology licenser	Note 1	
Pneumatic Earth Feed	By technology licenser	Note 1	
Bleaching Earth Dosing	By technology licenser	Note 1	
Cont. Heater-Bleacher	By technology licenser	Note 1	
Oil/Water Separator	By technology licenser	Note 1	
Bleaching Filter	By technology licenser	Note 1	
Stripper	By technology licenser	Note 1	
Steam Generator	By technology licenser	Note 1	
Chimney	By technology licenser	Note 1	
Daytank	By technology licenser	Note 1	
First Loop Reactor	By technology licenser	Note 1	
Second Loop Reactor	By technology licenser	Note 1	
Third Reactor	By technology licenser	Note 1	
Flash Heater	By technology licenser	Note 1	
Methyelster	By technology	Note 1	

TASK 9: US SOURCES OF SUPPLY

Condenser	licenser		
Acid/Methylester Mixer	By technology licenser	Note 1	
Separator	By technology licenser	Note 1	
Methylester Holding Vessel	By technology licenser	Note 1	
Glycerin Holding Vessel	By technology licenser	Note 1	
Methylester Heater	By technology licenser	Note 1	
Methylester Heater	By technology licenser	Note 1	
Centrifugal Separator	By technology licenser	Note 1	
Methylester Cooler	By technology licenser	Note 1	
Methylester Pre-heater	By technology licenser	Note 1	
Methylester Heater	By technology licenser	Note 1	
Methylester Condenser	By technology licenser	Note 1	
Biodiesel Drying Column	By technology licenser	Note 1	
Vacuum Package	By technology licenser	Note 1	
Neutralization Reactor	By technology licenser	Note 1	
Heat Exchanger	By technology licenser	Note 1	
Heat Exchanger	By technology licenser	Note 1	
Heat Recovery Exchanger	By technology licenser	Note 1	
Phase Separator	By technology licenser	Note 1	
Acidification Reactor	By technology licenser	Note 1	
Glycerin Pre-heater	By technology licenser	Note 1	
Glycerin Reboiler	By technology licenser	Note 1	

TASK 9: US SOURCES OF SUPPLY

Distillation Column	By technology licenser	Note 1	
Oil Pre-heater	By technology licenser	Note 1	
Oil Heater	By technology licenser	Note 1	
Oil Condenser	By technology licenser	Note 1	
Oil Vacuum Package	By technology licenser	Note 1	
Flash Chamber	By technology licenser	Note 1	
Gas-Liquid Separator	By technology licenser	Note 1	
Fatty Matter Purification	By technology licenser	Note 1	
Methanol Recovery System	Recovery of high purity methanol from the post reaction crude biodiesel and glycerin phases.	Koch Modular Process Systems, LLC.	45 Eisenhower Dr. Paramus, NJ 07652 Tel: (201) 368-2929 Fax: (201) 368-8989 General Email: systems@modular-process.com
		Biomass Section	
Biomass Furnace and Boiler System	Incineration of biomass and steam production	McBurney Boiler Systems	1650 International Ct. Ste. 100 Norcross, GA 30093 Tel: (770) 925-7100 Fax: (770) 925-7400 www.mcburney.com
		Factory Sales and Engineering, Inc.	P.O. Box 240 Covington, LA 70433 Tel: (985) 867-9150 Fax: (985) 867-9155 http://www.fsela.com
Steam Turbine/Generator	Power generation and steam delivery to refining and recovery plants	Meucci Equipment Sales Company, Inc. (MESCO)	550 Fairway Drive Woodstock, GA 30189 Tel: (770) 924-8241 Fax: (770) 924-8354 General Email:

TASK 9: US SOURCES OF SUPPLY

			mescoatl@comcast.net Technical Email: jfmeucci@mesco1.com
		Steam Turbine Generators, LLC.	P.O. Box 1955 Roswell, GA 30077 Tel: (678) 916-1500 Fax: (678) 919-7590 General Email: Sales@StgSets.com
		Pro Power Technical Sales	Tel: (770) 924-1436 Technical Email: dstowell@bellsouth.net
		Dresser-Rand	West8 Tower Suite 1000 10205 Westheimer Rd. Houston, TX 77042 Tel: (Int'l +1) (713) 354-6100 Fax: (Int'l +1) (713) 354-6110 General Email: Info@dresser-rand.com
Hog Grinder	Shred biomass material	Jordan Reduction Solutions	355 Clow Lane P.O. Box 170339 Birmingham, AL 35217 Tel: 1 (888) 733-8248 Fax: (205) 849-5075 General Email: Sales@JordanReductionSolutions.com
Screw Press		Vincent Corporation	2810 East 5th Ave Tampa, Florida 33605, U.S.A. Tel: (813) 248 2650 Fax: (813) 247 7557
POME Equipment			
General Process, OSBL, & Terminal Section			
Loading Arms	Transfer product to barge	Carbis	1430 West Darlington St. Florence, SC 29501

TASK 9: US SOURCES OF SUPPLY

			Tel: (843) 669-6668 Fax: (843) 662-1536 Sales Email: sales@carbis.net
		FMC / Chiksan	1803 Gears Road Houston, TX 77067 Tel: (281) 405-3030 General Email: Loading.systems_usa@fmcti.com
Loading Platform	Support product unloading on terminal	Carbis	1430 West Darlington St. Florence, SC 29501 Tel: (843) 669-6668 Fax: (843) 662-1536 Sales Email: sales@carbis.net
Pumps	Product delivery from storage	Goulds	240 Fall St. Seneca Falls, NY 13148 Tel: (315) 568-2811 Fax: (315) 568-2418
Plate and Frame Heat Exchangers	Cool/heat product	Alfa-Laval	5400 International Trade Drive Richmond, VA 23231 United States Phone: +1 804 222 5300
		Tranter	1213 Conrad Sauer Houston, TX 77043 Tel: (713) 467-0711 Fax: (713) 467-1502 General Email: dlusignolo@tranter.com
Cooling Tower	Generate cooling water for process	SPX – Marley	7401 West 129 St. Overland Park, KS 66213 Tel: (913) 664-7400 Fax: (913) 664-7439 General Email: spxcooling@ct.spx.com

TASK 9: US SOURCES OF SUPPLY

Selective Non-Catalytic Reduction System	Emissions control	Johnson Matthey Inc.	400 Lapp Road Malvern, PA 19355 Tel: (484) 320-2122 Fax: (484) 320-2152 General Email: info@jmssec.com
Delta V Control System	Plant process controls	Emerson	3850 Lakefield Drive Suwanee, GA 30024 Tel: (770) 495-3100 Fax: (770) 623-3663 Sales Email: Benton.bacot@controlsouthern.com

1 Technology licensers include:
Desmet Ballestra
450 Franklin Road, Suite 170
Marietta, GA 30067
(770) 693- 0061

Greenline Industries
2425 Larkspur Landing Circle
Larkspur, CA 94939 USA
(866) 247-4763

TASK 10: FINAL REPORT

SECTION 10 – FINAL REPORT (TASK 10)

Tasks 1-9 of the Terms of Reference are presented in report format in Sections 1-9 of this report. Task 10 (Final Report) is the compilation of these nine sections, the executive summary, and modifications requested by PTPN-III.

END OF REPORT

ACKNOWLEDGEMENTS

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PT PERKEBUNAN NUSANTARA III CLIENT TEAM
Dr.Ir. Chairul Muluk, Chairman of the Team
Dr. Krishna Surya Bhuana, MS, Secretary
Ir. Deny Mulyawan, MT, Chemical Engineer Expert
Drs. Suwarno, M.Si, Chemical Expert

PT TRACON INDUSTRI TEAM
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Mr. Nunung Haryanto - Biodiesel Refining Engineer and Biomass Waste-to-Energy Specialist
Mr. Hermawan Kusbudiarto – Senior Process Engineer

HANAFIAH PONGGAWA & PARTNERS POWER SECTOR TEAM
Mr. Stephen Magnuson - Licensing and Regulatory Expert

INTERNATIONAL TRADE AND INVESTMENT SPECIALIST
Mr. Clarence Haynes - Environmental and Development Specialist

UNIVERSITY OF GEORGIA CENTER FOR AGRIBUSINESS AND ECONOMIC DEVELOPMENT
Dr. George Shumaker - Biofuels Market Analyst
Dr. John McKissick - Agronomist

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APPENDIX A

FEASIBILITY STUDY SEMINAR

Feasibility Study Seminar
PT Perkebunan Nusantara III

Prime Engineering Inc.

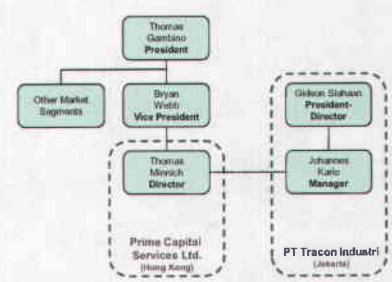
Thomas Minnich, P.E.
Michael Gootman, E.I.T.
11th March 2008

Selamat Siang

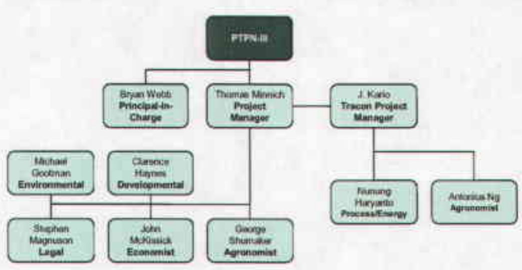
Prime Engineering Introduction

- **Company Background**
  - Founded in 1990 by Thomas Gambino
  - Headquartered in Atlanta, USA
  - Steady growth to over 60 staff
  - Market segment oriented company – trusted advisor to owner clients
- **Market Segments**
  - Energy: Downstream Petroleum, Ethanol, Biodiesel
  - Process Chemical: Sulfuric Acid, Acrylic Acid, Fine Chemicals
  - Aviation: Aircraft Fuel Storage and Distribution, Specialty Infrastructure
  - Municipal Works: Water, Wastewater
- **Presence in Asia-Pacific**
  - Prime Capital Services Ltd. established in Hong Kong in 2006
  - Business Partnership (non-equity joint venture) with PT Tracon Industri
  - Working relationship with Tracon since 2005
  - Concentrate on Feasibility Studies, Bankability Studies, Financial Structuring of Projects
  - Other partners: China, India

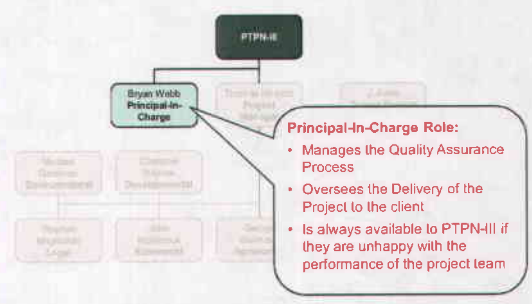
Prime Engineering Organization



Project Team Organization



Project Team Organization



Principal-In-Charge Role:
- Manages the Quality Assurance Process
- Oversees the Delivery of the Project to the client
- Is always available to PTPN-III if they are unhappy with the performance of the project team

Seminar Objectives

PRIME ENGINEERING

- Management and Planning
  - Planning steps
  - Business fundamentals
  - Regulatory and permitting
  - Site selection and proximity
- Technical Approach
  - Project Objectives
  - Refinery technology
  - Biomass-to-Energy technology
  - ASTM specifications and performance guarantees
- Economics and Financial
  - Agronomics and plantation management
  - Offtake Contracts and Power Purchase Agreements
  - Pro-forma analysis
  - Bankable Feasibility Study

PRIME ENGINEERING

Management and Planning

Feasibility Study Intent

PRIME ENGINEERING

PTPN III's Business Challenge	Prime Team's Direction
Develop a biodiesel refinery in two phases: (1) 60,000 MT/y (70 MM Liter/y) (2) 100,000 MT/y (118 MM Liter/y)	Implement Tracon process methodology, master plan the facility for expansion, and verify commercial issues (offtakes, logistics, performance guarantees, specifications)
Generate 4.8 MW of power via EFB waste-to-energy and sell surplus to PLN grid	Develop a sustainable and reliable biomass-to-energy concept and PPA contract language with PLN
Permitting and approvals	Provide BKPM, HGU, and IMBP permit analysis and identify factors for the AMDAL assessment
Economic justification	Agronomics, cropping rotation, margin sensitivity analysis, and cash flow pro-forma
Financial promotion	Produce bankable feasibility study documents, pitch the project to investors and lenders, recommend financial structuring
Environmental and developmental impact	Conduct preliminary evaluation under the World Bank/IFC and Equator Principles framework

Key Feasibility Factors

PRIME ENGINEERING

- Technical Feasibility
  - Application of Prime/Tracon's biodiesel refining process technology
  - Sustainable and reliable biomass-to-energy technology
  - What to do with the glycerin co-product
  - ASTM D6751 and BQ-9000
  - Detailed process technology decisions
  - Sources of U.S. supply
- Commercial Feasibility
  - Forward pricing on methylester product
  - Strength of Pertamina offtake contract and forward pricing terms
  - Pertamina's usage intent: B2, B5, B20, etc.
  - Impacts of agronomics trends
  - Swing production of CPO finished product to capture CPO commodity prices depending on Pertamina contract

Key Feasibility Factors

PRIME ENGINEERING

- Permits and Approvals
  - BKPM Permit: BKPM (Badan Koordinasi Penanaman Modal), Coordinating Bureau for Capital Investment issued for foreign investor deploying capital funds for asset development in Indonesia *IF* foreign investment participation is seeked
  - HGU Permit: HGU (Hak Guna Usaha) is the land-use permit and concession for business purposes.
  - IMB Permit: IMB (Izin Mendirikan Bangunan) permit for the bio-diesel refinery facility is required by the local planning authorities to build infrastructure or industrial facilities
  - AMDAL Assessment: AMDAL (Analisa Mengenai Dampak Lingkungan) or Environmental Impact Assessment can be performed by Prime Capital Services Ltd. within the framework of the Equator Principles, taking approximately three months to complete, occurring during the detailed design phase

Key Feasibility Factors

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- Regulatory and Legal
  - Power Purchase Agreement (PPA) contract with PLN
  - Regulatory establishment of a project company
  - Project company licensing
  - Contract terms with Pertamina
- Bankability
  - Construction cost estimate
  - Economic pro-forma analysis including PTPN SG&A, overhead, depreciation and tax treatments
  - Leveraging instruments
  - Internal Rate of Return (IRR) to equity holders
  - Key leveraged financial ratios: Debt Service Cover Ration (DSCR), Loan Life Cover Ratio (LLCR) – important metrics for borrower credit evaluation

Key Feasibility Factors

PRIME ENGINEERING

- **Logistics**
  - Product transportation
  - FOB point for sales
  - Bulk storage of finished products
  - Raw material supplies
- **Constructability**
  - Facility location
  - Construction accessibility
  - Presence of skilled contractors
- **Infrastructure**
  - Presence of basic utilities (water, natural gas, power, sewer)
  - Roadway access

Site Selection and Master Planning

Planning Schedule

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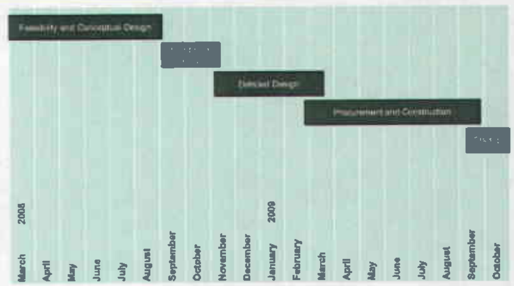

Business Planning

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- **Management Team**
  - Executive management
  - Operations management
  - Plantation management
  - Will need to assemble CV's and organization chart
- **Marketing and Sales Plan**
  - Market analysis and business risk planning (Pertamina and others)
  - Marketing, sales, and customer service staff
  - Marketing growth plan to support increase to 100,000 MT/year
  - Competitor Analysis and Pricing strategy
- **Administrative**
  - Overhead sharing with PTPN-I and PTPN-II
  - Enterprise Resource Planning (ERP) systems and IT systems
  - Staff growth plan to support increase

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Technical Approach

Project Objectives

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- **Land**
  - CPO mill, methylester refinery, storage systems, and waste-to-energy power plant at 25-hectare site in Sei Mangke, Simalungun District, North Sumatra
  - Harvest FFB from 110,000-hectare palm plantation in North Sumatra
- **Methylester Capacity**
  - Initial capacity of 60,000 tons per year
  - Expand to 100,000 tons per year within two years of operation
  - Full methanol recovery
  - Analysis of CPO/FFB conversion to support both capacities
  - Analysis of long term FFB supply from plantation
- **Co-product Capacity**
  - Glyceride trans-esterification
  - Analysis of optimal reaction parameters

Project Objectives

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- **Biomass Waste-to-Energy Capacity**
  - EFB waste conversion
  - 4.8 MW total power generation
  - Feasibility Study will develop a facility load list and estimate power surplus
  - Preliminary review of Power Purchase Agreement with PLN
- **Economics**
  - 10 year investment analysis horizon
  - Pro-forma free cash flow analysis
  - Internal Rate of Return (IRR)
  - Sensitivity Analysis: forward pricing, plantation yield, raw materials
- **Financial**
  - Debt service coverage analysis
  - Analysis of various leveraging instruments and benefits to equity holders

Preliminary Data Collection

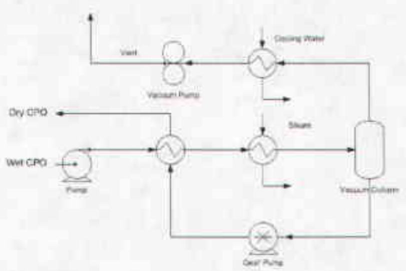
Data or Information Requested	Description
Plantation location	Coordinates and estimated hectares
Mill location	Coordinates and site dimensions
Refinery location	Coordinates and site dimensions
Process plant onstream time	Annual operating hours, planned shutdowns/turnarounds, or % onstream
Product performance commitments to offtaker: • Biodiesel Spec • Cloud Point (°C) • Pour Point (°C) • Freeze Point (°C) • Anticipated cetane no.	 ASTM D6751 ASTM D2500 ASTM D97 ASTM D5972
Soil conditions analysis	Soil type, Cation, pH, phosphorus, potassium, nitrogen analysis
Crop genus and species name	D x P (Dura x Pisifera)
Anticipated crop yield during years 0-5 of plant operation	FFB/ha/year
Anticipated time to full harvest	Number of years to full maturity
Anticipated long term crop yield	FFB/ha/year
Ownership of existing land	Land title holders
Local government concessions and permits for land use	Preliminary status with BKPM and AMDAL assessment
Availability of local utilities	Power, water, natural gas
Site access infrastructure	Road, rail, and port access
FOB (Free on Board) point of finished product	Balikpapan City Port, East Kalimantan, Indonesia
Anticipated offtake pricing	Determine margins for economic analysis
Anticipated offtake contract terms	Lock-in margins for duration of financing tenor

Processing Units

- **Oil Preparation and Pre-Treatment**
  - FFB Conveyance
  - Oil Expeller and Filtration
  - Feedstock Storage
  - Degumming
  - CPO pump, filtration, and transfer
- **Biodiesel Processing**
  - Feedstock Storage and Transfer
  - Catalyst Preparation
  - CPO Drying
  - ...

Processing Units

- **CPO Flash Drying to less than 0.1% moisture**

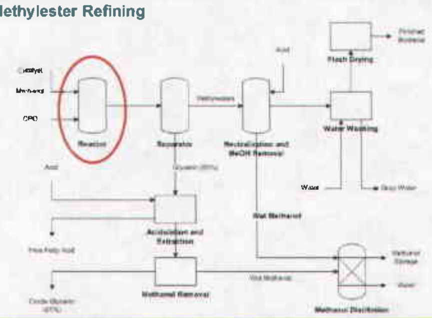


Processing Units

- **Biodiesel Processing - continued**
  - ...
  - Free Fatty Acid (FFA) Extraction
  - Washing Solution Preparation
  - Washing
  - Drying
  - Purification

Processing Units

- **Methylester Refining**

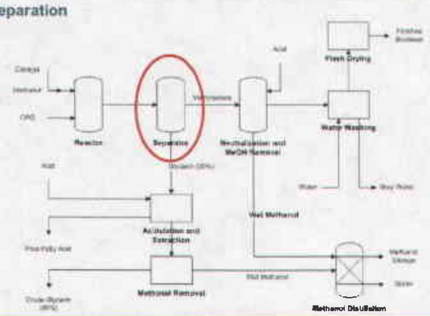


Processing Units

- **Methylester Reactor**
  - Pre-reaction conversion of FFA to methylesters prior to Triglycerides-to-Methylester Reaction (sulfuric acid esterification)
  - Triglyceride transesterification with alkali catalyst: Sodium Methoxide most efficient, KOH and NaOH also acceptable
  - Continuous reactor: Continuous Stirred Tank Reactor (CSTR) or Plug Flow Reactor
  - Stage in series with temperature control and intermediate glycerin removal to maintain favorable reaction driving force – need to add methanol appropriately
  - 6:1 molar ratio methanol:triglycerides minimum
  - Catalyst follows glycerin – need to add catalyst appropriately

Processing Units

- Separation

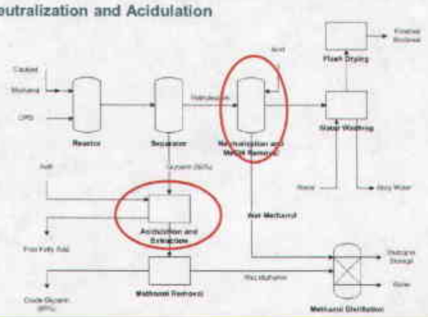


Separation

- **Gravity Decanting**
  - Specific Gravity (SG) of Glycerin = 1.26
  - Mixed with methanol, SG of glycerin = 1.05
  - SG methylester = 0.88
  - Gravity decanter separate top layer (methylester) from bottom layer (glycerin)
- **Centrifuging**
  - Decanting centrifuge
  - Pusher centrifuge
  - Centrate = glycerin; Retentate = methanol
  - Can be continuous or batch

Processing Units

- Neutralization and Acidulation

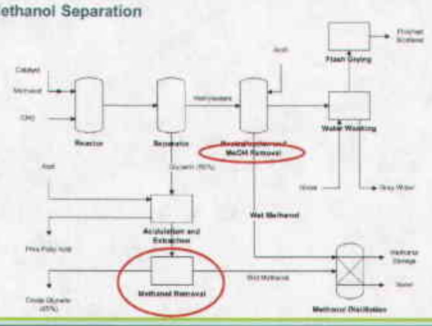


Neutralization and Acidulation

- **Neutralization**
  - Neutralize residual catalyst with an acid
  - Catalyst = Sodium Methoxide ($NaOCH_3$)
  - $NaOCH_3 + HCl \rightarrow CH_3OH + NaCl$
  - Methanol recovered in methanol distillation unit
  - Salt continues with glycerin product until separated
- **FFA Extraction**
  - Reaction soaps split to FFA and salt by acidulation
  - Soap + HCl → FFA + NaCl
  - Store and sell FFA as product
  - Recycle FFA to FFA esterification process at beginning of refinery (react with Sulfuric Acid)

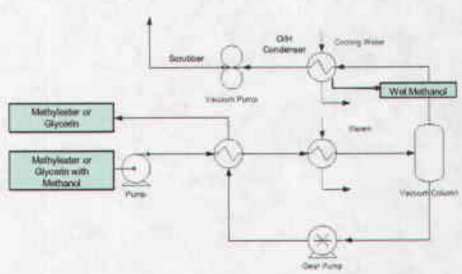
Processing Units

- Methanol Separation



Processing Units

- Methanol Separation



Processing Units

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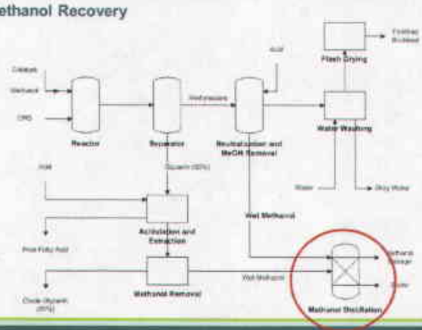
- Methanol Recovery



Processing Units

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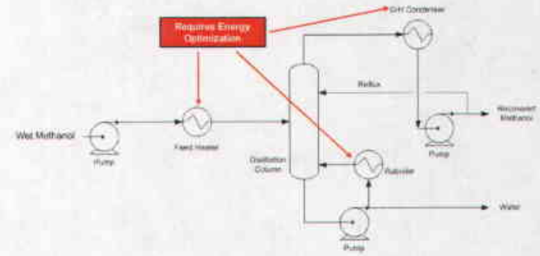
- Methanol Recovery



Processing Units

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- **Water Washing**
  - Countercurrent Washing
  - Counterflow Packed Wash Column
  - Rotating Disk Extractor
- **Tank Farm**
  - CPO Storage Tank
  - Feedstock Day Tank
  - Methanol Storage Tank
  - Biodiesel Storage Tank
  - Crude Glycerin Storage Tank
  - Process Water Pond

Coordinate Tank Sizes and Quantities with Production and Logistics Schedule

Supporting Units

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- **Utilities**
  - Water Treatment Plant
  - Wastewater Treatment Plant
  - Cooling Water Supply System
  - Chilled Water Supply System (for overhead condensers)
  - Instrument and Utility Air System
  - Boiler and Steam Supply System
  - Turbogenerator
- **Facility**
  - Plant Building (Control Room, MCC)
  - Office Building
  - Powerhouse Building
  - Scales
  - Logistics Facilities: Truck Loading/Unloading; Marine (Barge or Ship) Loading; Rail (?)
  - Offsite Facilities: Bill of Lading; Guard Shack; Warehouse; Maintenance

Waste-To-Energy Unit

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- **EFB Preparation and Combustion**
  - EFB Disinfection
  - EFB/Fiber Grinder
  - Gasification
  - Furnace with emission controls
- **Turbine Generator**
  - Condensing Steam Turbine
  - Low Pressure (LP) Steam Extraction for internal usage
  - 4.8 MW Generator
- **Power Distribution and Transmission**
  - Distribution Voltage (4160V) Transformer
  - Transmission Voltage (15 kV or more?) Grid Substation
- **Steam System**
  - Deaerator
  - Boiler Feedwater (BFW) Treatment and Makeup
  - Economizer

Waste-To-Energy Unit

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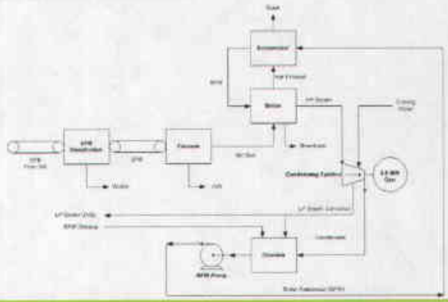
- EFB to Power Generation



Technology Selection

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				
[illegible]				
[illegible]				
Purification				
[illegible] effluent				
[illegible]				
[illegible] production				
[illegible] carbon				
[illegible] gas				

Economics and Financial

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Current Plantation Characteristics

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Tree Age Group	Percent of Total	Estimated Land Area
Under 2 years	9.40%	9,105 ha
2 to 5 years	29.95%	29,009 ha
5 to 10 years	13.00%	12,592 ha
10 to 15 years	13.16%	12,747 ha
15 to 20 years	2.41%	2,334 ha
Over 20 years	32.08%	31,072 ha

Historical Crop Yield

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Year	Yield (Tonnes of FFB per hectare)
2002	16.452
2003	17.861
2004	20.137
2005	20.226
2006	21.103
2007	20.225
2010 Projection	22.310

Oil Supply Required

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- **Approximate Yields**
  - FFB to CPO (Crude Palm Oil) = 22%
  - CPO to RBD (Refined, Bleached, Deodorized) palm oil = 95%
  - RBD to Methylester = 95%
- **Required for Operations**
  - The following table indicates CPO and FFB required for initial and expanded capacities:

Biodiesel (Methylester) Capacity	CPO Required (tonnes/year)	FFB Required (tonnes/year)
60,000 MT/year	66,000	300,000
100,000 MT/year	110,000	500,000

10-Year Plantation Projections

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- **Palm Tree Economic Life**
  - Assumed 25 years
  - >25 years: too large to manually harvest the crop
  - Cut down at 26 years
  - Land replanted with one year old seedlings
- **New Trees**
  - Seedlings cultivated in a nursery for one year prior to planting
  - Zero FFB production from trees <3 years
- **Tree Productivity**
  - Trees productivity increases during economic life
  - Adequate rainfall, fertilization, and pest/disease control essential

Tree Age Group Yield

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Tree Age Group	Yield as a Percent of Plantation Average
Under 2 years	0%
2 to 5 years	29%
5 to 10 years	80%
10 to 15 years	136%
15 to 20 years	167%
Over 20 years	189%

Yield Projection

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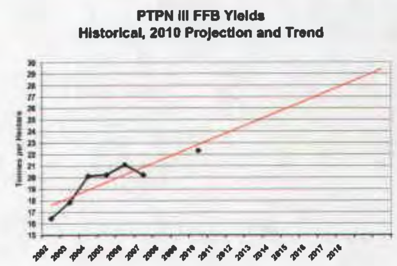

Plant Age Distribution Projection

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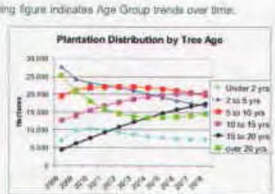
- Assumptions
  - Total land planted = 96,858 hectares
  - In any future year, 20% of trees >20 years will be removed and replanted to seedling trees
  - In younger age groups, 20% of each group will move up to the next age group each year
  - Except for trees 2-5 years, where 25% will move up each year
- Distribution Projection
  - The following figure indicates Age Group trends over time.



Project Plantation Production

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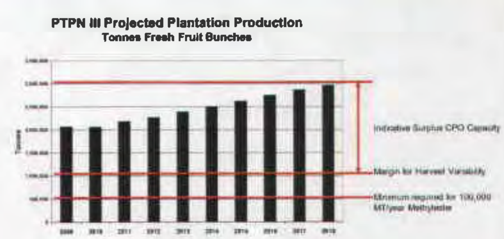

Cropping Rotation Trend

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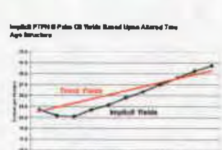
- Altering Tree Age Structure for Sustainable Yields:
  - "Implicit Yields" are the plantation yields based on the tree replacement regime outlined previously
  - Yields are lower than trend yields for first several years
  - Near future yields; however, begin to surpass trend yields
  - Suggesting this tree replacement regime will improve plantation sustainability



Year	Yield [illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Project Agreements

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- Offtake Contracts
  - Product Sales Agreements
- Power Purchase Agreement
  - Grid Supply Agreement
- EPC Contract
  - Engineering, Procurement, Construction
- O&M Contract
  - Operating and Maintenance Agreement

Offtake Contracts

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- **Sales Terms**
  - Terms of sales and pricing or allowable volatility
  - Offtaker cancellation terms
  - Volume
  - PTPN-III clauses and penalties
  - Take-Or-Pay Terms: obligates offtaker to purchase a minimum volume of product each month or pay the equivalent amount to PTPN-III
- **Offtaker Attributes**
  - Credit quality
  - Contract currency terms
  - Intended end-use of product
- **Concessions**
  - Other agreements from governments or agencies in place
  - Operating licenses

Power Purchase Agreement

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- **PPA Structure Serves Two Functions**
  - Guarantees a market, cost basis, and predictable revenue stream
  - Defines the rights, responsibilities, and obligations of PTPN-III throughout the financing, construction, and operations phases of the project
- **Risk Pass-Through**
  - Generation capacity, schedule, on-stream time
  - O&M risk
  - Fuel supply risk
  - PPA SHOULD DEFINE PROTECTIONS, INCENTIVES, AND DAMAGES ALLOCATED APPROPRIATELY TO EACH PARTY OF THE PPA
- **PPA Terms**
  - Capacity price structured to include operating expenses, debt service, and return on equity
  - Energy price PASS-THROUGH: cover risk of variation in EFB fuel value, variation in harvesting and plantation expenses
  - Metering requirements
  - Definition of substation battery limit – where is PLN grid connection point?

EPC Contract

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- **Engineering**
  - Experience in designing biodiesel facilities
  - Quality of cost estimates and determination of contingency funds
- **Procurement**
  - Availability and Delivery Schedule of specialized equipment
  - Tariffs and currency exchange
- **Construction**
  - Majority of cash drawdowns will occur during construction
  - Credit quality of EPC contractor
  - Track record of on-budget and on-time completion
  - Terms of Liquidated Damages
  - Incentives for budget and schedule performance

O&M Contract

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- **Operations**
  - Provision of technician or engineering staff
  - Operational KPI's (Key Performance Indicators)
  - Incentives for on-stream time and capacity performance
- **Maintenance**
  - Provision of technician or engineering staff
  - Preventive Maintenance Program
  - Reliability metrics
  - Scheduled maintenance down-time or turnarounds

Pro-Forma Model

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- **Build the Cash Flow Analysis**
  - Revenue Growth
  - Cost of Goods Sold (COGS) and Overheads
  - Increases/Decreases in Assets and Liabilities
  - Changes in Net Working Capital
- **Start with Volume Projections (below)**
  - Continue with the other financial statements and project economics on the following slides

[illegible]

Volume/Yr - [illegible]

	2007	2008	2009	2010	2011	2012
Product A Volume			[illegible]	[illegible]	[illegible]	[illegible]
Product B Volume			[illegible]	[illegible]	[illegible]	[illegible]
Product C Volume			[illegible]	[illegible]	[illegible]	[illegible]
Product D Volume						
[illegible]	2007	2008	2009	2010	2011	2012
Raw Materials	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Utilities						
Conversion	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Net Income

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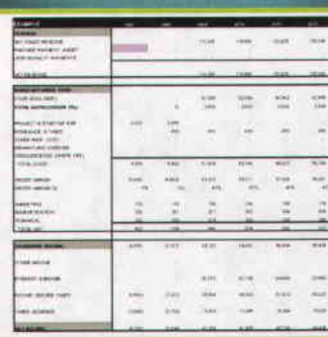
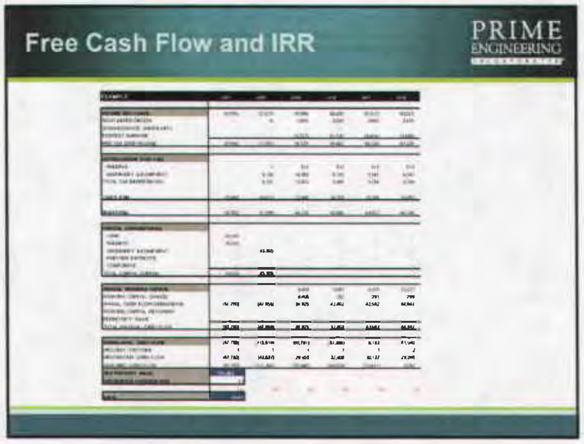
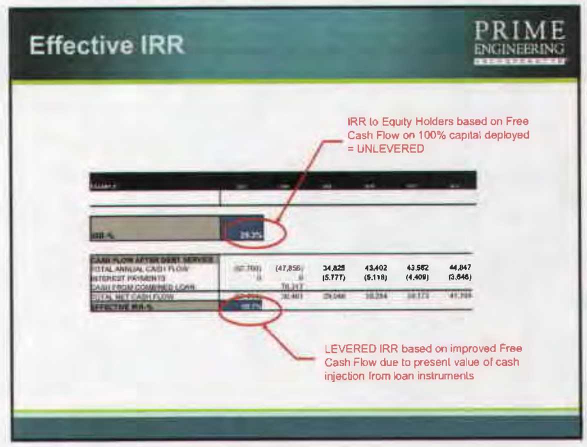
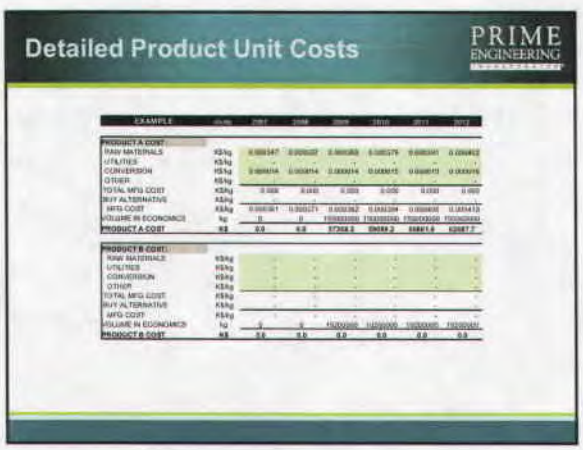
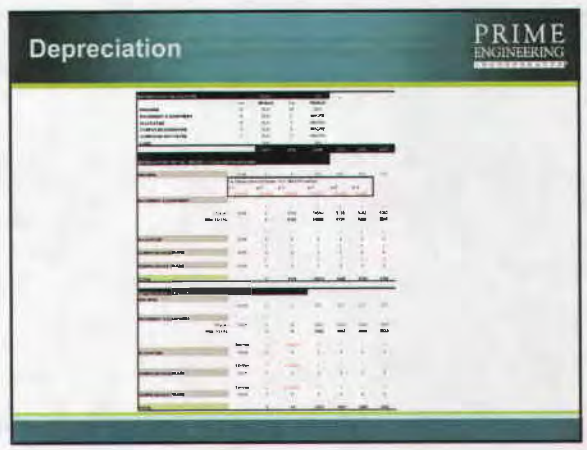
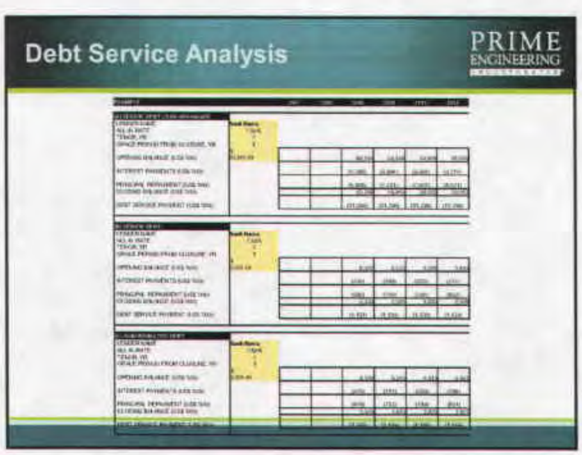


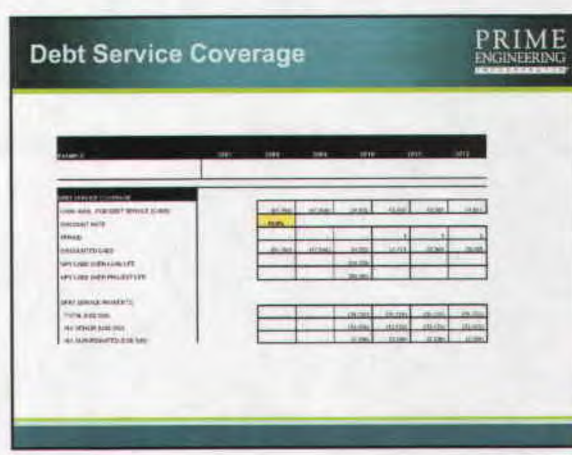

Free Cash Flow and IRR
PRIME ENGINEERING


Effective IRR
PRIME ENGINEERING
IRR to Equity Holders based on Free Cash Flow on 100% capital deployed = UNLEVERED
LEVERED IRR based on improved Free Cash Flow due to present value of cash injection from loan instruments

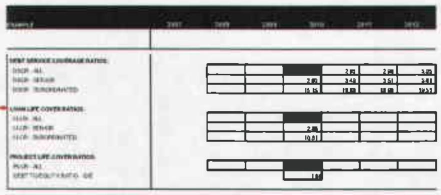

Detailed Product Unit Costs
PRIME ENGINEERING


Depreciation
PRIME ENGINEERING


Debt Service Analysis
PRIME ENGINEERING

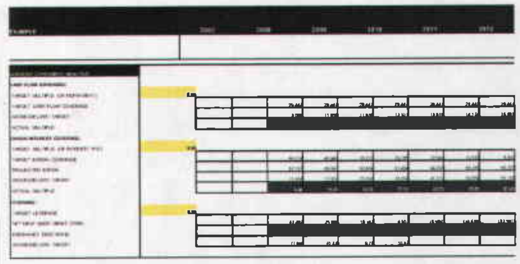

Debt Service Coverage
PRIME ENGINEERING

Key Financial Ratios



Loan Life Cover Ratio (LLCR) Guidelines:
- Full Off-Take, No Cross-Currency Risk= 1.20 – 1.30
- Partial Off-Take, Cross-Currency Risk = 1.50 – 2.00

Lender's Covenants Analysis



Developmental Analysis

- **Infrastructure Impact**
  - Project impacts on regional/national fuel infrastructure
  - Impact on social structure of region and utility resources
- **Market-Oriented Reform**
  - Compliance with GOI privatization reform initiatives
  - Impact of CPO divergence from food supply
- **Human Capacity Building**
  - Operational shift analysis
  - Skills requirement
  - Jobs creation – both labor and professional
  - Development and training

Developmental Analysis

- **Technology Transfer**
  - Transfer of professional skills and intellectual expertise to PTPN-III
  - Legal analysis – intellectual property law
- **Natural Resource Usage**
  - Palm oil plantation: irrigation, phosphate fertilizers
  - Utilities: water
- **Government Revenue**
  - Operation of plant is programmed to provide government revenues
  - PTPN-III to define: taxation revenue, tariffs, or government ownership?
  - Include separately in economic analysis

Preliminary Environmental Analysis

- **Solid and Liquid Wastes**
  - Wastes recycled or reclaimed where possible: EFB, FFA, Methanol, Water/Gray Water
  - Waste disposal in accordance with local regulations
  - Hazardous materials, solvents, oils, sludges, wastewater disposed in a manner to prevent soil, groundwater, and surface water contamination
- **Impact on Forested Lands, Air Quality, and Waste**
  - Statement of forested lands razed for (i) Plantation Expansion, (ii) Physical Assets
  - Estimation of carbon improvement affected by PTPN-III's placement of biodiesel in the distillate fuels market
  - Carbon improvement by using EFB waste versus fossil fuel
  - Disposal and Landfill avoidance
- **Environmental Compliance**
  - Technologies to attain compliance with stack gas emissions and liquid effluents regulations
  - Cost estimates of compliance equipment and monitoring

Preliminary Environmental Analysis

- **Environmental Impact Review**
  - World Bank and IFC Environmental Policy
  - Equator Principles
- **Liquid Effluents**
  - Treatment requirements for pH, $BOD_{[illegible]}$, oil/grease, TSS, cyanide and heavy metals
  - Pretreatment requirements of local authorities
  - Adequate treatment system capacity
- **Stack Emissions**
  - Particulates (PM10)
  - NO_x
  - SO_2
- **Ambient Noise**
  - Noise abatement measures
  - Estimation of noise at receptors located outside project property boundary

Biodiesel Certification

PRIME ENGINEERING INCORPORATED

- **Sustainability Organizations**
  - IEA – International Energy Agency
  - WWF – World Wildlife Federation
  - RSPO – Roundtable on Sustainable Palm Oil
  - Goal: Identify conservation efforts undertaken by PTPN-III
- **Product Organizations**
  - ASTM D6751
  - BQ-9000: Combination of ASTM D6751 and Quality Systems Program (similar to ISO-9000)
    - Beneficial if any PTPN-III product is being exported to North America
    - Quality systems related to sampling, storage, testing, shipping, blending, and distribution

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Terima Kasih !

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PRIME CAPITAL SERVICES LIMITED Economic and Project Finance Analysis

APPENDIX B

ECONOMIC ANALYSIS WORKBOOKS

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PROJECT ECONOMICS SUMMARY

Client Name	PT Perkebunan Nusantara III
Project Number	1267-0001.000
Plant/Location	Sei Mangkie, Indonesia
Project Name	Biodiesel Feasibility Study
Task Name	Economic Analysis

Person Performing Economics:	T. Minnich, T. Cheng
Date Last Revised	29-Jul-2008

ECONOMIC SUMMARY	Target	Max
IRR - %	3.5%	#NUM!
NPV - K$	(49,313)	-
DISC PAYBACK YRS	-	-

PROJECT TYPE: Revenue Growth

BRIEF PROJECT DESCRIPTION / REASON FOR PROJECT:

100,000 MT/year Biodiesel Refinery
10 MW (approximate) Biomass Waste-to-Energy Power Plant
Existing Crude Palm Oil (CPO) processing at PTPN-III's Sei Mangkie CPO Mill

CASE: This case represents the market convergence in 2015 of US$800/tonne CPO price and US$2,015/ton Biodiesel price plus sale of 80% Crude Glycerin at US$530/MT.

CAPITAL & EXPENSE - K$:

Target:	2008	2009	2010	2011	Total
Capital	-	73,105.0	500.0	500.0	74,105.0
Computer Hardware	-	-	-	-	-
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Buildings	1,000.0	1,000.0	-	-	2,000.0
Engineering/Consulting	1,917.8	4,475.0	-	-	6,392.8
Startup	-	3,044.2	-	-	3,044.2
Dismantlement	-	-	-	-	-
Total NFI	2,917.8	81,624.2	500.0	500.0	85,542.0
Allocated U&S Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Max	2008	2009	2010	2011	Total
Capital	-	-	-	-	-
Computer Hardware	-				
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Building	-	-	-	-	-
FEE and Capital Services	-	-	-	-	-
Startup	-	-	-	-	-
Dismantlement	-	-	-	-	-
Total NFI	-	-	-		-
Allocated Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Project Release Date	Info only	6/1/2008
Project Spending Begins	Info only	6/1/2008
Project Startup		12/31/2009
Project Benefits Begin	info only	12/31/2009

PROJECT BENEFITS:

Data Input Section

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

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Input form for "Standard Projects"

Revenue Growth Projects

Volume/Yr - kg	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Volume	-	-	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0
Product B Volume	-	-	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0
Product C Volume (MWh)	-	-	52,867.500	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5
Product D Volume	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod A	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Methyl Ester													
Notes 2, 5 Raw Materials	0.000089	0.001139	0.001114	0.001089	0.001064	0.001039	0.001014	0.000989	0.000964	0.000939	0.000914	0.000889	0.000889
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Note 3 Conversion	0.0000179	0.0000184	0.0000189	0.0000195	0.0000201	0.0000207	0.0000213	0.0000220	0.0000226	0.0000233	0.0000240	0.0000247	0.0000254
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**

Increm Cost/unit Prod B	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Technical Glycerin													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod C	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Power to PLN													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod D	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
-													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Low Tier Selling Price/unit
or Buy Price for Make vs. Buy Cases

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Price (k$/kg)	0.00123	0.00129	0.00135	0.00141	0.00147	0.00154	0.00161	0.00169	0.00176	0.00184	0.00193	0.002017	0.00211
Product B Price (k$/kg)	-	-	-	-	-	-	-	-	-	-	-	-	-
Product C Price (k$/MWh)	0.05833	0.06008	0.06189	0.06374	0.06565	0.06762	0.06965	0.07174	0.07389	0.07611	0.07840	0.08075	0.08317
Product D Price	-	-	-	-	-	-	-	-	-	-	-	-	-

Royalty Pmts % of NSR	0%
Note 4 Working Capital % of Revenue	9.29%

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Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

	MAT: k$	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Note 4	Selling Expenses	-	-	4,135.4	4,324.1	4,521.4	4,727.7	4,943.5	5,169.1	5,405.1	5,651.8	5,909.9	6,179.7	6,462.0
Note 4	General & Admin Exp	-	-	31,705.0	33,151.4	34,664.0	36,245.8	37,899.9	39,629.8	41,438.8	43,330.6	45,309.0	47,377.9	49,541.6
Note 4	Other Expenses	-	-	5,513.9	5,765.5	6,028.5	6,303.6	6,591.3	6,892.1	7,206.7	7,535.8	7,879.8	8,239.6	8,615.9

KEY SENSITIVITIES:

Note 1: Incremental cost per unit for Product A includes costs for all Products A, B, and C.
Note 2: Raw materials costs based on Greenline Industries costs for methanol, methylate, ion resin recharge - CPO cost EXCLUDED = $89 per metric ton
Note 3: Conversion costs based on Indonesian labor, supervisory, maintenance, laboratory, and others at $17.85 per metric ton
Note 4: Costs estimated based on Annual Report Analysis

Growth Rate = 4.6% Annual growth of biodiesel sales price

CPO 2008 Price = 1050 US$/MT (CPO Basis)
Note 5: CPO Price is added to Raw Materials Cost in year 2009 then linearly decreased to $800/MT to 2019

Annual G&A 23% of revenue

WACC = 16.4% Weighted Average Cost of Capital (investment hurdle rate)

PRIME ENGINEERING

EXHIBIT "A" - INCREMENTAL INCOME STATEMENT - K$

PT Perkebunan Nusantara III	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
REVENUE:										
NET SALES REVENUE	0	0	137848	144137	150713	157590	164782	172303	180169	188394
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0
NET REVENUE	0	0	137848	144137	150713	157590	164782	172303	180169	188394
MANUFACTURING COST:										
COGS (EXCL DEP.)	0	0	113294	110851	108409	105969	103531	101095	98661	96229
TOTAL DEPRECIATION (SL)	0	14	4997	4997	4997	4997	4997	4997	4997	4997
PROJECT & START-UP EXP	1918	7519	0	0	0	0	0	0	0	0
INSURANCE & TAXES	0	731	736	741	741	741	741	741	741	741
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	1918	8264	119027	116589	114148	111708	109270	106834	104400	101968
GROSS MARGIN	-1918	-8264	18821	27548	36565	45882	55512	65469	75769	86426
GROSS MARGIN-%	0%	0%	14%	19%	24%	29%	34%	38%	42%	46%
SELLING	0	0	4135	4324	4521	4728	4943	5169	5405	5652
GENERAL & ADMINISTRATIVE	0	0	31705	33151	34664	36246	37900	39630	41439	43331
OTHER EXPENSES	0	0	5514	5765	6029	6304	6591	6892	7207	7536
TOTAL MAT	0	0	41354	43241	45214	47277	49435	51691	54051	56518
OPERATING INCOME:	-1918	-8264	-22534	-15693	-8648	-1395	6078	13778	21718	29908
OTHER INCOME	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-6287	-5635	-4914	-4117	-3236	-2263	-1188	0
INCOME BEFORE TAXES	-1918	-8264	-16246	-10059	-3735	2722	9314	16042	22906	29908
TAXES ACCRUED	-575	-2479	-4874	-3018	-1120	817	2794	4813	6872	8972
NET INCOME:	-1342	-5785	-11372	-7041	-2614	1905	6520	11229	16034	20936

PT Perkebunan Nusantara III	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
REVENUE:										
NET SALES REVENUE	196996	205991	215398	215398	215398	215398	215398	215398	215398	215398
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0
NET REVENUE	196996	205991	215398	215398	215398	215398	215398	215398	215398	215398
MANUFACTURING COST:										
COGS (EXCL DEP.)	93799	91371	91445	91445	91445	91445	91445	91445	91445	91445
TOTAL DEPRECIATION (SL)	4997	4997	4997	4997	4997	4997	4984	57	57	57
PROJECT & START-UP EXP	0	0	0	0	0	0	0	0	0	0
INSURANCE & TAXES	741	741	741	741	741	741	741	741	741	741
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	99537	97109	97184	97184	97184	97184	97170	92243	92243	92243
GROSS MARGIN	97458	108882	118215	118215	118215	118215	118228	123155	123155	123155
GROSS MARGIN-%	49%	53%	55%	55%	55%	55%	55%	57%	57%	57%
SELLING	5910	6180	6462	6462	6462	6462	6462	6462	6462	6462
GENERAL & ADMINISTRATIVE	45309	47378	49542	49542	49542	49542	49542	49542	49542	49542
OTHER EXPENSES	7880	8240	8616	8616	8616	8616	8616	8616	8616	8616
TOTAL MAT	59099	61797	64620	64620	64620	64620	64620	64620	64620	64620
OPERATING INCOME:	38359	47084	53595	53595	53595	53595	53609	58536	58536	58536
OTHER INCOME	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	0	0	0	0	0	0	0	0
INCOME BEFORE TAXES	38359	47084	53595	53595	53595	53595	53609	58536	58536	58536
TAXES ACCRUED	11508	14125	16079	16079	16079	16079	16083	17561	17561	17561
NET INCOME:	26852	32959	37517	37517	37517	37517	37526	40975	40975	40975

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EXHIBIT "B" - INCREMENTAL CASH FLOW - K$

PT Perkebunan Nusantara III

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
INCOME BEF TAXES:	-1918	-8264	-16246	-10059	-3735	2722	9314	16042	22906	29908
BOOK DEPRECIATION	0	14	4997	4997	4997	4997	4997	4997	4997	4997
OBSOLESCENCE (WRITE-OFF)	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-6287	-5635	-4914	-4117	-3236	-2263	-1188	0
PRE-TAX CASH INCOME	-1918	-8250	-17536	-10696	-3651	3603	11075	18776	26716	34906
DEPRECIATION (FOR TAX):										
BUILDING	0	0	51	51	51	51	51	51	51	51
MACHINERY & EQUIPMENT	0	14821	23714	14228	8537	8537	4268	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0
TOTAL TAX DEPRECIATION	0	14821	23765	14279	8588	8588	4320	51	51	51
TAXES PAID	-575	-6921	-12390	-7493	-3672	-1496	2027	5617	7999	10456
SUBTOTAL:	-1342	-1329	-5146	-3203	21	5098	9049	13159	18716	24449
CAPITAL EXPENDITURES:										
LAND	0	0	0	0	0	0	0	0	0	0
BUILDING	1000	1000	0	0	0	0	0	0	0	0
MACHINERY & EQUIPMENT	0	73105	500	500	0	0	0	0	0	0
PARTNER PAYMENTS	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPEND.	1000	74105	500	500	0	0	0	0	0	0
ANNUAL WORKING CAPITAL	0	0	12806	13390	14001	14640	15308	16007	16738	17502
WORKING CAPITAL CHANGE	0	0	12806	584	611	639	668	699	731	764
ANNUAL CASH FLOW OPERATIONS	-2342	-75434	-18452	-4288	-590	4460	8380	12460	17986	23685
WORKING CAPITAL RECOVERY										
PERPETUITY VALUE										
TOTAL ANNNUAL CASH FLOW	-2342	-75434	-18452	-4288	-590	4460	8380	12460	17986	23685
CUMULATIVE CASH FLOW	-2342	-77776	-96228	-100516	-101106	-96646	-88266	-75806	-57820	-34135
DISCOUNT FACTORS	1.00	1.16	1.35	1.58	1.84	2.14	2.49	2.90	3.37	3.92
DISCOUNTED CASH FLOW	-2342	-64806	-13619	-2719	-321	2087	3369	4304	5337	6038
CUM DISC CASH FLOW	-2342	-67148	-80767	-83485	-83807	-81720	-78351	-74047	-68710	-62672
NET PRESENT VALUE	-49313									
DISCOUNTED PAYBACK-YRS	0.0									
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IRR-%	3.5%									

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
INCOME BEF TAXES:	38359	47084	53595	53595	53595	53595	53609	58536	58536	58536
BOOK DEPRECIATION	4997	4997	4997	4997	4997	4997	4984	57	57	57
OBSOLESCENCE (WRITE-OFF)	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	0	0	0	0	0	0	0	0
PRE-TAX CASH INCOME	43357	52082	58593	58593	58593	58593	58593	58593	58593	58593
DEPRECIATION (FOR TAX):										
BUILDING	51	51	51	51	51	51	51	51	51	51
MACHINERY & EQUIPMENT	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0
TOTAL TAX DEPRECIATION	51	51	51	51	51	51	51	51	51	51
TAXES PAID	12992	15609	17562	17562	17562	17562	17562	17562	17562	17562
SUBTOTAL:	30365	36473	41030	41030	41030	41030	41030	41030	41030	41030
CAPITAL EXPENDITURES:										
LAND	0	0	0	0	0	0	0	0	0	0
BUILDING	0	0	0	0	0	0	0	0	0	0
MACHINERY & EQUIPMENT	0	0	0	0	0	0	0	0	0	0
PARTNER PAYMENTS	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPEND.	0	0	0	0	0	0	0	0	0	0
ANNUAL WORKING CAPITAL	18301	19137	20011	20011	20011	20011	20011	20011	20011	20011
WORKING CAPITAL CHANGE	799	836	874	0	0	0	0	0	0	0
ANNUAL CASH FLOW OPERATIONS	29566	35637	40156	41030	41030	41030	41030	41030	41030	41030
WORKING CAPITAL RECOVERY		0								
PERPETUITY VALUE		1	0	0	0	0	0	0	0	0
TOTAL ANNNUAL CASH FLOW	29566	35638	40156	41030	41030	41030	41030	41030	41030	41030
CUMULATIVE CASH FLOW	-4569	31069	71225	112256	153286	194316	235347	276377	317408	358438
DISCOUNT FACTORS	4.57	5.31	6.19	7.20	8.38	9.76	11.36	13.22	15.39	17.91
DISCOUNTED CASH FLOW	6475	6705	6491	5698	4895	4205	3613	3104	2667	2291
CUM DISC CASH FLOW	-56196	-49491	-43000	-37302	-32407	-28201	-24588	-21484	-18818	-16527
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

IRR and NPV Formulas must be reviewed to ensure that calculations are based on 10 years benefits after project startup

CASH FLOW AFTER DEBT SERVICE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
TOTAL ANNUAL CASH FLOW	(2,342)	(75,434)	(18,452)	(4,288)	(590)	4,460	8,380	12,460	17,986	23,685
INTEREST PAYMENTS	0	0	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	0
CASH FROM COMBINED LOAN		59,879								
TOTAL NET CASH FLOW	(2,342)	(15,554)	(24,739)	(9,922)	(5,504)	343	5,144	10,197	16,798	23,685
EFFECTIVE IRR-%	10.6%									

CASH FLOW AFTER DEBT SERVICE	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
TOTAL ANNUAL CASH FLOW	29,566	35,638	40,156	41,030	41,030	41,030	41,030	41,030	41,030	41,030
INTEREST PAYMENTS	0	0	0	0	0	0	0	0	0	0
CASH FROM COMBINED LOAN										
TOTAL NET CASH FLOW	29,566	35,638	40,156	41,030	41,030	41,030	41,030	41,030	41,030	41,030

PT Perkebunan Nusantara III

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PRIME ENGINEERING

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
(A) SENIOR DEBT LEAD ARRANGER																					
LENDER NAME	**Bank Name**																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ 59,879.41			59,879	53,664	46,796	39,207	30,821	21,554	11,315											
INTEREST PAYMENTS (US$ '000)				(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)											
PRINCIPAL REPAYMENT (US$ '000)				(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)											
CLOSING BALANCE (US$ '000)				53,664	46,796	39,207	30,821	21,554	11,315	0											
DEBT SERVICE PAYMENT (US$ '000)				(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)											
(B) SENIOR DEBT																					
LENDER NAME	**Bank Name**																				
ALL-IN RATE	9.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(C) SUBORDINATED DEBT																					
LENDER NAME	**Bank Name**																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(D) SUBORDINATED DEBT																					
LENDER NAME	**Bank Name**																				
ALL-IN RATE	11.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
DEBT FACILITY COMBINED - ALL																					
OPENING BALANCE (US$ '000)		-	-	59,879	53,664	46,796	39,207	30,821	21,554	11,315	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	53,664	46,796	39,207	30,821	21,554	11,315	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
DEBT FACILITY COMBINED - SENIOR																					
OPENING BALANCE (US$ '000)		-	-	59,879	53,664	46,796	39,207	30,821	21,554	11,315	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	53,664	46,796	39,207	30,821	21,554	11,315	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PRIME ENGINEERING

DEBT FACILITY COMBINED - SUB																				
OPENING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE COVERAGE																				
CASH AVAIL. FOR DEBT SERVICE (CADS)	(2,342)	(75,434)	(18,452)	(4,288)	(590)	4,460	8,380	12,460	17,986	23,685	29,566	35,638	40,156	41,030	41,030	41,030	41,030	41,030	41,030	41,030
DISCOUNT RATE, BLENDED	10.5%																			
PERIOD	-	-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISCOUNTED CADS	(2,342)	(75,434)	(18,452)	(3,880)	(483)	3,305	5,621	7,563	9,880	11,774	13,301	14,510	14,796	13,681	12,381	11,205	10,140	9,176	8,304	7,515
NPV CADS OVER LOAN LIFE			3,554																	
NPV CADS OVER PROJECT LIFE			130,338																	
DEBT SERVICE PAYMENTS:																				
TOTAL (US$ '000)	-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
ALL SENIOR (US$ '000)	-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
ALL SUBORDINATED (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SENIOR DEBT CADS:																				
CASH FLOW AVAIL FOR SENIOR DEBT			SHORT	SHORT	SHORT	SHORT	SHORT	SHORT	17,986											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SENIOR DEBT			-	-	-	-	-	-	9,880											
NPV CADS OVER LOAN LIFE			9,880																	
SUBORDINATED DEBT CADS:																				
CASH FLOW AVAIL FOR SUB DEBT			SHORT	SHORT	SHORT	SHORT	SHORT	SHORT	5,483											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SUB DEBT			-	-	-	-	-	-	3,012											
NPV CADS OVER LOAN LIFE			3,012																	
DEBT SERVICE COVERAGE RATIOS:																				
DSCR TARGET GUIDELINES: 1.15-1.35																				
DSCR - ALL			(1.48)	(0.34)	(0.05)	0.36	0.67	1.00	1.44											
DSCR - SENIOR			(1.48)	(0.34)	(0.05)	0.36	0.67	1.00	1.44											
DSCR - SUBORDINATED			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!											
LOAN LIFE COVER RATIOS:																				
LLCR - ALL			0.15																	
LLCR - SENIOR			0.10																	
LLCR - SUBORDINATED			#DIV/0!																	
PROJECT LIFE COVER RATIOS:																				
PLCR - ALL			2.11																	
DEBT TO EQUITY RATIO - D/E			2.33																	

LLCR TARGET GUIDELINES:	GOOD	BETTER
* Full Offtake, No Cross-Currency Risk:	1.20	1.30
* Partial Offtake, No Cross-Currency Risk:	1.50	2.00

Data Input Section

Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

PROJECT ECONOMICS SUMMARY

Client Name	PT Perkebunan Nusantara III
Project Number	1267-0001.000
Plant/Location	Sei Mangkie, Indonesia
Project Name	Biodiesel Feasibility Study
Task Name	Economic Analysis

Person Performing Economics:	T. Minnich, T. Cheng
Date Last Revised	29-Jul-2008

ECONOMIC SUMMARY	Target	Max
IRR - %	6.8%	#NUM!
NPV - K$	(37,051)	-
DISC PAYBACK YRS	-	-

PROJECT TYPE: Revenue Growth

BRIEF PROJECT DESCRIPTION / REASON FOR PROJECT:

100,000 MT/year Biodiesel Refinery
10 MW (approximate) Biomass Waste-to-Energy Power Plant
Existing Crude Palm Oil (CPO) processing at PTPN-III's Sei Mangkie CPO Mill

CASE: This case represents the market convergence in 2015 of US$800/tonne CPO price and US$2,015/ton Biodiesel price plus sale of 80% Crude Glycerin at US$530/MT

CAPITAL & EXPENSE - K$:

Target:	2008	2009	2010	2011	Total
Capital	-	73,105.0	500.0	500.0	74,105.0
Computer Hardware	-	-	-	-	-
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Buildings	1,000.0	1,000.0	-	-	2,000.0
Engineering/Consulting	1,917.8	4,475.0	-	-	6,392.8
Startup	-	3,044.2	-	-	3,044.2
Dismantlement	-	-	-	-	-
Total NFI	**2,917.8**	**81,624.2**	**500.0**	**500.0**	**85,542.0**
Allocated U&S Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Max	2008	2009	2010	2011	Total
Capital	-	-	-	-	-
Computer Hardware	-				
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Building	-	-	-	-	-
FEE and Capital Services	-	-	-	-	-
Startup	-	-	-	-	-
Dismantlement	-	-	-	-	-
Total NFI	-	-	-		-
Allocated Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Project Release Date	Info only	6/1/2008
Project Spending Begins	Info only	6/1/2008
Project Startup		12/31/2009
Project Benefits Begin	info only	12/31/2009

PROJECT BENEFITS:

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING

Input form for "Standard Projects"

Revenue Growth Projects

Volume/Yr - kg	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Volume	-	-	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0
Product B Volume	-	-	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0
Product C Volume (MWh)	-	-	52,867.500	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5
Product D Volume	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod A	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Methyl Ester													
Notes 2, 5 Raw Materials	0.000089	0.001139	0.001114	0.001089	0.001064	0.001039	0.001014	0.000989	0.000964	0.000939	0.000914	0.000889	0.000889
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Note 3 Conversion	0.0000179	0.0000184	0.0000189	0.0000195	0.0000201	0.0000207	0.0000213	0.0000220	0.0000226	0.0000233	0.0000240	0.0000247	0.0000254
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**

Increm Cost/unit Prod B	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Technical Glycerin													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod C	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Power to PLN													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod D	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
-													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Low Tier Selling Price/unit
or Buy Price for Make vs. Buy Cases

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Price (k$/kg)	0.00123	0.00129	0.00135	0.00141	0.00147	0.00154	0.00161	0.00169	0.00176	0.00184	0.00193	0.002017	0.00211
Product B Price (k$/kg)	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053
Product C Price (k$/MWh)	0.05833	0.06008	0.06189	0.06374	0.06565	0.06762	0.06965	0.07174	0.07389	0.07611	0.07840	0.08075	0.08317
Product D Price	-	-	-	-	-	-	-	-	-	-	-	-	-

Royalty Pmts % of NSR	0%
Note 4 Working Capital % of Revenue	9.29%

PRIME ENGINEERING

Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

	MAT: k$	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Note 4	Selling Expenses	-	-	4,325.4	4,514.1	4,711.4	4,917.7	5,133.5	5,359.1	5,595.1	5,841.8	6,099.9	6,369.7	6,652.0
Note 4	General & Admin Exp	-	-	33,161.7	34,608.1	36,120.7	37,702.5	39,356.6	41,086.5	42,895.5	44,787.3	46,765.7	48,834.7	50,998.3
Note 4	Other Expenses	-	-	5,767.3	6,018.8	6,281.9	6,557.0	6,844.6	7,145.5	7,460.1	7,789.1	8,133.2	8,493.0	8,869.3

KEY SENSITIVITIES:

Note 1: Incremental cost per unit for Product A includes costs for all Products A, B, and C.
Note 2: Raw materials costs based on Greenline Industries costs for methanol, methylate, ion resin recharge - CPO cost EXCLUDED = $89 per metric ton
Note 3: Conversion costs based on Indonesian labor, supervisory, maintenance, laboratory, and others at $17.85 per metric ton
Note 4: Costs estimated based on Annual Report Analysis

Growth Rate = 4.6% Annual growth of biodiesel sales price

CPO 2008 Price = 1050 US$/MT (CPO Basis)
Note 5: CPO Price is added to Raw Materials Cost in year 2009 then linearly decreased to $800/MT to 2019

Annual G&A 23% of revenue

WACC = 16.4% Weighted Average Cost of Capital (investment hurdle rate)

EXHIBIT "A" - INCREMENTAL INCOME STATEMENT - K$

PRIME ENGINEERING

PT Perkebunan Nusantara III

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
REVENUE:																				
NET SALES REVENUE	0	0	144182	150470	157047	163924	171116	178637	186502	194727	203329	212325	221732	221732	221732	221732	221732	221732	221732	221732
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NET REVENUE	0	0	144182	150470	157047	163924	171116	178637	186502	194727	203329	212325	221732	221732	221732	221732	221732	221732	221732	221732
MANUFACTURING COST:																				
COGS (EXCL DEP.)	0	0	113294	110851	108409	105969	103531	101095	98661	96229	93799	91371	91445	91445	91445	91445	91445	91445	91445	91445
TOTAL DEPRECIATION (SL)	0	14	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4984	57	57	57
PROJECT & START-UP EXP	1918	7519	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSURANCE & TAXES	0	731	736	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	1918	8264	119027	116589	114148	111708	109270	106834	104400	101968	99537	97109	97184	97184	97184	97184	97170	92243	92243	92243
GROSS MARGIN	-1918	-8264	25154	33881	42899	52216	61846	71803	82102	92760	103792	115215	124548	124548	124548	124548	124562	129489	129489	129489
GROSS MARGIN-%	0%	0%	17%	23%	27%	32%	36%	40%	44%	48%	51%	54%	56%	56%	56%	56%	56%	58%	58%	58%
SELLING	0	0	4325	4514	4711	4918	5133	5359	5595	5842	6100	6370	6652	6652	6652	6652	6652	6652	6652	6652
GENERAL & ADMINISTRATIVE	0	0	33162	34608	36121	37702	39357	41086	42895	44787	46766	48835	50998	50998	50998	50998	50998	50998	50998	50998
OTHER EXPENSES	0	0	5767	6019	6282	6557	6845	7145	7460	7789	8133	8493	8869	8869	8869	8869	8869	8869	8869	8869
TOTAL MAT	0	0	43254	45141	47114	49177	51335	53591	55951	58418	60999	63697	66520	66520	66520	66520	66520	66520	66520	66520
OPERATING INCOME:	-1918	-8264	-18100	-11260	-4215	3039	10511	18212	26152	34342	42793	51518	58029	58029	58029	58029	58042	62969	62969	62969
OTHER INCOME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-6287	-5635	-4914	-4117	-3236	-2263	-1188	0	0	0	0	0	0	0	0	0	0	0
INCOME BEFORE TAXES	-1918	-8264	-11813	-5625	699	7156	13747	20475	27340	34342	42793	51518	58029	58029	58029	58029	58042	62969	62969	62969
TAXES ACCRUED	-575	-2479	-3544	-1688	210	2147	4124	6143	8202	10302	12838	15455	17409	17409	17409	17409	17413	18891	18891	18891
NET INCOME:	-1342	-5785	-8269	-3938	489	5009	9623	14333	19138	24039	29955	36062	40620	40620	40620	40620	40630	44078	44078	44078

EXHIBIT "B" - INCREMENTAL CASH FLOW - K$

PRIME ENGINEERING

PT Perkebunan Nusantara III

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
INCOME BEF TAXES:	-1918	-8264	-11813	-5625	699	7156	13747	20475	27340	34342	42793	51518	58029	58029	58029	58029	58042	62969	62969	62969
BOOK DEPRECIATION	0	14	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4984	57	57	57
OBSOLESCENCE (WRITE-OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-6287	-5635	-4914	-4117	-3236	-2263	-1188	0	0	0	0	0	0	0	0	0	0	0
PRE-TAX CASH INCOME	-1918	-8250	-13103	-6262	782	8036	15509	23209	31149	39339	47790	56515	63026	63026	63026	63026	63026	63026	63026	63026
DEPRECIATION (FOR TAX):																				
BUILDING	0	0	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
MACHINERY & EQUIPMENT	0	14821	23714	14228	8537	8537	4268	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL TAX DEPRECIATION	0	14821	23765	14279	8588	8588	4320	51	51	51	51	51	51	51	51	51	51	51	51	51
TAXES PAID	-575	-6921	-11060	-6163	-2342	-166	3357	6947	9329	11786	14322	16939	18892	18892	18892	18892	18892	18892	18892	18892
SUBTOTAL:	-1342	-1329	-2042	-100	3124	8202	12152	16262	21820	27553	33469	39576	44134	44134	44134	44134	44134	44134	44134	44134
CAPITAL EXPENDITURES:																				
LAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BUILDING	1000	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACHINERY & EQUIPMENT	0	73105	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PARTNER PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPEND.	1000	74105	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL WORKING CAPITAL	0	0	13394	13979	14590	15229	15897	16595	17326	18090	18889	19725	20599	20599	20599	20599	20599	20599	20599	20599
WORKING CAPITAL CHANGE	0	0	13394	584	611	639	668	699	731	764	799	836	874	0	0	0	0	0	0	0
ANNUAL CASH FLOW OPERATIONS	-2342	-75434	-15937	-1184	2513	7563	11484	15563	21089	26789	32670	38740	43260	44134	44134	44134	44134	44134	44134	44134
WORKING CAPITAL RECOVERY												0								
PERPETUITY VALUE												1	0	0	0	0	0	0	0	0
TOTAL ANNNUAL CASH FLOW	-2342	-75434	-15937	-1184	2513	7563	11484	15563	21089	26789	32670	38741	43260	44134	44134	44134	44134	44134	44134	44134
CUMULATIVE CASH FLOW	-2342	-77776	-93713	-94897	-92384	-84821	-73337	-57774	-36685	-9896	22773	61515	104775	148908	193042	237176	281310	325443	369577	413711
DISCOUNT FACTORS	1.00	1.16	1.35	1.58	1.84	2.14	2.49	2.90	3.37	3.92	4.57	5.31	6.19	7.20	8.38	9.76	11.36	13.22	15.39	17.91
DISCOUNTED CASH FLOW	-2342	-64806	-11762	-751	1369	3539	4617	5376	6258	6829	7155	7289	6993	6129	5265	4524	3886	3339	2868	2464
CUM DISC CASH FLOW	-2342	-67148	-78911	-79661	-78292	-74753	-70136	-64760	-58502	-51673	-44518	-37229	-30236	-24107	-18841	-14318	-10432	-7093	-4225	-1761
NET PRESENT VALUE	-37051																			
DISCOUNTED PAYBACK-YRS	0.0																			
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IRR-%	6.8%																			

IRR and NPV Formulas must be reviewed to ensure that calculations are based on 10 years benefits after project startup

CASH FLOW AFTER DEBT SERVICE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
TOTAL ANNUAL CASH FLOW	(2,342)	(75,434)	(15,937)	(1,184)	2,513	7,563	11,484	15,563	21,089	26,789	32,670	38,741	43,260	44,134	44,134	44,134	44,134	44,134	44,134	44,134
INTEREST PAYMENTS	0	0	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	0	0	0	0	0	0	0	0	0	0	0
CASH FROM COMBINED LOAN		59,879																		
TOTAL NET CASH FLOW	(2,342)	(15,554)	(22,224)	(6,819)	(2,400)	3,446	8,248	13,300	19,901	26,789	32,670	38,741	43,260	44,134	44,134	44,134	44,134	44,134	44,134	44,134
EFFECTIVE IRR-%	15.9%																			

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PT Perkebunan Nusantara III

PRIME ENGINEERING

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
(A) SENIOR DEBT LEAD ARRANGER																					
LENDER NAME	**Bank Name**																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ 59,879.41			59,879	53,664	46,796	39,207	30,821	21,554	11,315											
INTEREST PAYMENTS (US$ '000)				(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)											
PRINCIPAL REPAYMENT (US$ '000)				(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)											
CLOSING BALANCE (US$ '000)				53,664	46,796	39,207	30,821	21,554	11,315	0											
DEBT SERVICE PAYMENT (US$ '000)				(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)											
(B) SENIOR DEBT																					
LENDER NAME	**Bank Name**																				
ALL-IN RATE	9.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(C) SUBORDINATED DEBT																					
LENDER NAME	**Bank Name**																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(D) SUBORDINATED DEBT																					
LENDER NAME	**Bank Name**																				
ALL-IN RATE	11.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
DEBT FACILITY COMBINED - ALL																					
OPENING BALANCE (US$ '000)		-	-	59,879	53,664	46,796	39,207	30,821	21,554	11,315	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	53,664	46,796	39,207	30,821	21,554	11,315	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
DEBT FACILITY COMBINED - SENIOR																					
OPENING BALANCE (US$ '000)		-	-	59,879	53,664	46,796	39,207	30,821	21,554	11,315	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	53,664	46,796	39,207	30,821	21,554	11,315	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PRIME ENGINEERING

DEBT FACILITY COMBINED - SUB																				
OPENING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE COVERAGE																				
CASH AVAIL. FOR DEBT SERVICE (CADS)	(2,342)	(75,434)	(15,937)	(1,184)	2,513	7,563	11,484	15,563	21,089	26,789	32,670	38,741	43,260	44,134	44,134	44,134	44,134	44,134	44,134	44,134
DISCOUNT RATE, BLENDED	10.5%																			
PERIOD	-	-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISCOUNTED CADS	(2,342)	(75,434)	(15,937)	(1,072)	2,058	5,605	7,703	9,447	11,585	13,317	14,698	15,773	15,939	14,716	13,318	12,052	10,907	9,870	8,933	8,084
NPV CADS OVER LOAN LIFE			19,389																	
NPV CADS OVER PROJECT LIFE			156,995																	
DEBT SERVICE PAYMENTS:																				
TOTAL (US$ '000)	-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
ALL SENIOR (US$ '000)	-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
ALL SUBORDINATED (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SENIOR DEBT CADS:																				
CASH FLOW AVAIL FOR SENIOR DEBT			SHORT	SHORT	SHORT	SHORT	SHORT	15,563	21,089											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SENIOR DEBT			-	-	-	-	-	9,447	11,585											
NPV CADS OVER LOAN LIFE			21,032																	
SUBORDINATED DEBT CADS:																				
CASH FLOW AVAIL FOR SUB DEBT			SHORT	SHORT	SHORT	SHORT	SHORT	3,061	8,586											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SUB DEBT			-	-	-	-	-	1,858	4,717											
NPV CADS OVER LOAN LIFE			6,574																	
DEBT SERVICE COVERAGE RATIOS:																				
DSCR TARGET GUIDELINES: 1.15-1.35																				
DSCR - ALL			(1.27)	(0.09)	0.20	0.60	0.92	1.24	1.69											
DSCR - SENIOR			(1.27)	(0.09)	0.20	0.60	0.92	1.24	1.69											
DSCR - SUBORDINATED			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!											
LOAN LIFE COVER RATIOS:																				
LLCR - ALL			0.40		LLCR TARGET GUIDELINES:				GOOD	BETTER										
LLCR - SENIOR			0.29		* Full Offtake, No Cross-Currency Risk:				1.20	1.30										
LLCR - SUBORDINATED			#DIV/0!		* Partial Offtake, No Cross-Currency Risk:				1.50	2.00										
PROJECT LIFE COVER RATIOS:																				
PLCR - ALL			2.56																	
DEBT TO EQUITY RATIO - D/E			2.33																	

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

PROJECT ECONOMICS SUMMARY

Client Name	PT Perkebunan Nusantara III
Project Number	1267-0001.000
Plant/Location	Sei Mangkie, Indonesia
Project Name	Biodiesel Feasibility Study
Task Name	Economic Analysis

Person Performing Economics:	N. Joshi
Date Last Revised	21-Aug-2008

ECONOMIC SUMMARY	Target	Max
IRR - %	61.4%	#NUM!
NPV - K$	122,289	-
DISC PAYBACK YRS	3.9	-

PROJECT TYPE: Revenue Growth

BRIEF PROJECT DESCRIPTION / REASON FOR PROJECT:

100,000 MT/year Biodiesel Refinery
10 MW (approximate) Biomass Waste-to-Energy Power Plant
Existing Crude Palm Oil (CPO) processing at PTPN-III's Sei Mangkie CPO Mill

CASE: This case represents the market convergence in 2015 of US$800/tonne CPO price and US$2,015/ton Biodiesel price plus sale of 80% Crude Glycerin at US$530/MT

CAPITAL & EXPENSE - K$:

Target:	2008	2009	2010	2011	Total
Capital	-	73,105.0	500.0	500.0	74,105.0
Computer Hardware	-	-	-	-	-
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Buildings	1,000.0	1,000.0	-	-	2,000.0
Engineering/Consulting	1,917.8	4,475.0	-	-	6,392.8
Startup	-	3,044.2	-	-	3,044.2
Dismantlement	-	-	-	-	-
Total NFI	**2,917.8**	**81,624.2**	**500.0**	**500.0**	**85,542.0**
Allocated U&S Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Max	2008	2009	2010	2011	Total
Capital	-	-	-	-	-
Computer Hardware	-				-
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Building	-	-	-	-	-
FEE and Capital Services	-	-	-	-	-
Startup	-	-	-	-	-
Dismantlement	-	-	-	-	-
Total NFI	-	-	-		-
Allocated Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Project Release Date	Info only	6/1/2008
Project Spending Begins	Info only	6/1/2008
Project Startup		12/31/2009
Project Benefits Begin	info only	12/31/2009

PROJECT BENEFITS:

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

Revenue Growth Projects

Volume/Yr - kg

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Volume	-	-	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0
Product B Volume	-	-	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0
Product C Volume (MWh)	-	-	52,867.500	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5
Product D Volume	-	-	-	-	-	-	-	-	-	-	-	-	-

	Increm Cost/unit Prod A	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Methyl Ester													
Notes 2, 5	Raw Materials	0.000089	0.000089	0.000169	0.000249	0.000329	0.000409	0.000489	0.000569	0.000649	0.000729	0.000809	0.000889	0.000889
	Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Note 3	Conversion	0.0000179	0.0000184	0.0000189	0.0000195	0.0000201	0.0000207	0.0000213	0.0000220	0.0000226	0.0000233	0.0000240	0.0000247	0.0000254
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total Incremental	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**

Increm Cost/unit Prod B	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Technical Glycerin													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod C	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Power to PLN													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod D	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
-													
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Low Tier Selling Price/unit or Buy Price for Make vs. Buy Cases

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Price (k$/kg)	0.00123	0.00129	0.00135	0.00141	0.00147	0.00154	0.00161	0.00169	0.00176	0.00184	0.00193	0.002017	0.00211
Product B Price (k$/kg)	-	-	-	-	-	-	-	-	-	-	-	-	-
Product C Price (k$/MWh)	0.05833	0.06008	0.06189	0.06374	0.06565	0.06762	0.06965	0.07174	0.07389	0.07611	0.07840	0.08075	0.08317
Product D Price	-	-	-	-	-	-	-	-	-	-	-	-	-

	Royalty Pmts % of NSR	0%
Note 4	Working Capital % of Revenue	9.29%

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

MAT: k$	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Note 4 Selling Expenses	-	-	4,135.4	4,324.1	4,521.4	4,727.7	4,943.5	5,169.1	5,405.1	5,651.8	5,909.9	6,179.7	6,462.0
Note 4 General & Admin Exp	-	-	31,705.0	33,151.4	34,664.0	36,245.8	37,899.9	39,629.8	41,438.8	43,330.6	45,309.0	47,377.9	49,541.6
Note 4 Other Expenses	-	-	5,513.9	5,765.5	6,028.5	6,303.6	6,591.3	6,892.1	7,206.7	7,535.8	7,879.8	8,239.6	8,615.9

KEY SENSITIVITIES:

Note 1: Incremental cost per unit for Product A includes costs for all Products A, B, and C.
Note 2: Raw materials costs based on Greenline Industries costs for methanol, methylate, ion resin recharge - CPO cost EXCLUDED = $89 per metric ton
Note 3: Conversion costs based on Indonesian labor, supervisory, maintenance, laboratory, and others at $17.85 per metric ton
Note 4: Costs estimated based on Annual Report Analysis

Growth Rate = 4.6% Annual growth of biodiesel sales price

CPO 2008 Price = 0 US$/MT (CPO Basis)
Note 5: CPO Price is added to Raw Materials Cost in year 2009 then linearly decreased to $800/MT to 2019

Annual G&A 23% of revenue

WACC = 16.4% Weighted Average Cost of Capital (investment hurdle rate)

EXHIBIT "A" - INCREMENTAL INCOME STATEMENT - K$

PRIME ENGINEERING

PT Perkebunan Nusantara III	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
REVENUE:																				
NET SALES REVENUE	0	0	137848	144137	150713	157590	164782	172303	180169	188394	196996	205991	215398	215398	215398	215398	215398	215398	215398	215398
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NET REVENUE	0	0	137848	144137	150713	157590	164782	172303	180169	188394	196996	205991	215398	215398	215398	215398	215398	215398	215398	215398
MANUFACTURING COST:																				
COGS (EXCL DEP.)	0	0	18794	26851	34909	42969	51031	59095	67161	75229	83299	91371	91445	91445	91445	91445	91445	91445	91445	91445
TOTAL DEPRECIATION (SL)	0	14	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4984	57	57	57
PROJECT & START-UP EXP	1918	7519	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSURANCE & TAXES	0	731	736	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	1918	8264	24527	32589	40648	48708	56770	64834	72900	80968	89037	97109	97184	97184	97184	97184	97170	92243	92243	92243
GROSS MARGIN	-1918	-8264	113321	111548	110065	108882	108012	107469	107269	107426	107958	108882	118215	118215	118215	118215	118228	123155	123155	123155
GROSS MARGIN-%	0%	0%	82%	77%	73%	69%	66%	62%	60%	57%	55%	53%	55%	55%	55%	55%	55%	57%	57%	57%
SELLING	0	0	4135	4324	4521	4728	4943	5169	5405	5652	5910	6180	6462	6462	6462	6462	6462	6462	6462	6462
GENERAL & ADMINISTRATIVE	0	0	31705	33151	34664	36246	37900	39630	41439	43331	45309	47378	49542	49542	49542	49542	49542	49542	49542	49542
OTHER EXPENSES	0	0	5514	5765	6029	6304	6591	6892	7207	7536	7880	8240	8616	8616	8616	8616	8616	8616	8616	8616
TOTAL MAT	0	0	41354	43241	45214	47277	49435	51691	54051	56518	59099	61797	64620	64620	64620	64620	64620	64620	64620	64620
OPERATING INCOME:	-1918	-8264	71966	68307	64852	61605	58578	55778	53218	50908	48859	47084	53595	53595	53595	53595	53609	58536	58536	58536
OTHER INCOME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-6287	-5635	-4914	-4117	-3236	-2263	-1188	0	0	0	0	0	0	0	0	0	0	0
INCOME BEFORE TAXES	-1918	-8264	78254	73941	69765	65722	61814	58042	54406	50908	48859	47084	53595	53595	53595	53595	53609	58536	58536	58536
TAXES ACCRUED	-575	-2479	23476	22182	20930	19717	18544	17413	16322	15272	14658	14125	16079	16079	16079	16079	16083	17561	17561	17561
NET INCOME:	-1342	-5785	54778	51759	48836	46005	43270	40629	38084	35636	34202	32959	37517	37517	37517	37517	37526	40975	40975	40975

EXHIBIT "B" - INCREMENTAL CASH FLOW - K$

PRIME ENGINEERING

PT Perkebunan Nusantara III

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
INCOME BEF TAXES:	-1918	-8264	78254	73941	69765	65722	61814	58042	54406	50908	48859	47084	53595	53595	53595	53595	53609	58536	58536	58536
BOOK DEPRECIATION	0	14	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4984	57	57	57
OBSOLESCENCE (WRITE-OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-6287	-5635	-4914	-4117	-3236	-2263	-1188	0	0	0	0	0	0	0	0	0	0	0
PRE-TAX CASH INCOME	-1918	-8250	76964	73304	69849	66603	63575	60776	58216	55906	53857	52082	58593	58593	58593	58593	58593	58593	58593	58593
DEPRECIATION (FOR TAX):																				
BUILDING	0	0	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
MACHINERY & EQUIPMENT	0	14821	23714	14228	8537	8537	4268	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL TAX DEPRECIATION	0	14821	23765	14279	8588	8588	4320	51	51	51	51	51	51	51	51	51	51	51	51	51
TAXES PAID	-575	-6921	15960	17707	18378	17404	17777	18217	17449	16756	16142	15609	17562	17562	17562	17562	17562	17562	17562	17562
SUBTOTAL:	-1342	-1329	61004	55597	51471	49198	45799	42559	40766	39149	37715	36473	41030	41030	41030	41030	41030	41030	41030	41030
CAPITAL EXPENDITURES:																				
LAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BUILDING	1000	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACHINERY & EQUIPMENT	0	73105	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PARTNER PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPEND.	1000	74105	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL WORKING CAPITAL	0	0	12806	13390	14001	14640	15308	16007	16738	17502	18301	19137	20011	20011	20011	20011	20011	20011	20011	20011
WORKING CAPITAL CHANGE	0	0	12806	584	611	639	668	699	731	764	799	836	874	0	0	0	0	0	0	0
ANNUAL CASH FLOW OPERATIONS	-2342	-75434	47698	54512	50860	48560	45130	41860	40036	38385	36916	35637	40156	41030	41030	41030	41030	41030	41030	41030
WORKING CAPITAL RECOVERY												0								
PERPETUITY VALUE												1	0	0	0	0	0	0	0	0
TOTAL ANNNUAL CASH FLOW	-2342	-75434	47698	54512	50860	48560	45130	41860	40036	38385	36916	35638	40156	41030	41030	41030	41030	41030	41030	41030
CUMULATIVE CASH FLOW	-2342	-77776	-30078	24434	75294	123854	168984	210844	250880	289265	326181	361819	401975	443006	484036	525066	566097	607127	648158	689188
DISCOUNT FACTORS	1.00	1.16	1.35	1.58	1.84	2.14	2.49	2.90	3.37	3.92	4.57	5.31	6.19	7.20	8.38	9.76	11.36	13.22	15.39	17.91
DISCOUNTED CASH FLOW	-2342	-64806	35204	34565	27705	22725	18145	14459	11880	9786	8085	6705	6491	5698	4895	4205	3613	3104	2667	2291
CUM DISC CASH FLOW	-2342	-67148	-31944	2621	30326	53052	71196	85655	97535	107321	115406	122112	128603	134301	139196	143401	147014	150118	152784	155075
NET PRESENT VALUE	122289																			
DISCOUNTED PAYBACK-YRS	3.9																			
	0.0	0.0	0.0	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IRR-%	61.4%																			

IRR and NPV Formulas must be reviewed to ensure that calculations are based on 10 years benefits after project startup

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
CASH FLOW AFTER DEBT SERVICE																				
TOTAL ANNUAL CASH FLOW	(2,342)	(75,434)	47,698	54,512	50,860	48,560	45,130	41,860	40,036	38,385	36,916	35,638	40,156	41,030	41,030	41,030	41,030	41,030	41,030	41,030
INTEREST PAYMENTS	0	0	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	0	0	0	0	0	0	0	0	0	0	0
CASH FROM COMBINED LOAN		59,879																		
TOTAL NET CASH FLOW	(2,342)	(15,554)	41,411	48,878	45,946	44,443	41,894	39,597	38,848	38,385	36,916	35,638	40,156	41,030	41,030	41,030	41,030	41,030	41,030	41,030
EFFECTIVE IRR-%	193.9%																			

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PT Perkebunan Nusantara III

PRIME ENGINEERING

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
(A) SENIOR DEBT LEAD ARRANGER																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ 59,879.41			59,879	53,664	46,796	39,207	30,821	21,554	11,315											
INTEREST PAYMENTS (US$ '000)				(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)											
PRINCIPAL REPAYMENT (US$ '000)				(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)											
CLOSING BALANCE (US$ '000)				53,664	46,796	39,207	30,821	21,554	11,315	0											
DEBT SERVICE PAYMENT (US$ '000)				(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)											
(B) SENIOR DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	9.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(C) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(D) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	11.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
DEBT FACILITY COMBINED - ALL																					
OPENING BALANCE (US$ '000)		-	-	59,879	53,664	46,796	39,207	30,821	21,554	11,315	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	53,664	46,796	39,207	30,821	21,554	11,315	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
DEBT FACILITY COMBINED - SENIOR																					
OPENING BALANCE (US$ '000)		-	-	59,879	53,664	46,796	39,207	30,821	21,554	11,315	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	53,664	46,796	39,207	30,821	21,554	11,315	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PRIME ENGINEERING

DEBT FACILITY COMBINED - SUB																				
OPENING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE COVERAGE																				
CASH AVAIL. FOR DEBT SERVICE (CADS)	(2,342)	(75,434)	47,698	54,512	50,860	48,560	45,130	41,860	40,036	38,385	36,916	35,638	40,156	41,030	41,030	41,030	41,030	41,030	41,030	41,030
DISCOUNT RATE, BLENDED	10.5%																			
PERIOD	-	-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISCOUNTED CADS	(2,342)	(75,434)	47,698	49,333	41,653	35,991	30,271	25,409	21,992	19,082	16,608	14,510	14,796	13,681	12,381	11,205	10,140	9,176	8,304	7,515
NPV CADS OVER LOAN LIFE			252,346																	
NPV CADS OVER PROJECT LIFE			389,744																	
DEBT SERVICE PAYMENTS:																				
TOTAL (US$ '000)	-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
ALL SENIOR (US$ '000)	-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
ALL SUBORDINATED (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SENIOR DEBT CADS:																				
CASH FLOW AVAIL FOR SENIOR DEBT			47,698	54,512	50,860	48,560	45,130	41,860	40,036											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SENIOR DEBT			47,698	49,333	41,653	35,991	30,271	25,409	21,992											
NPV CADS OVER LOAN LIFE			252,346																	
SUBORDINATED DEBT CADS:																				
CASH FLOW AVAIL FOR SUB DEBT			35,195	42,010	38,357	36,057	32,628	29,357	27,533											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SUB DEBT			35,195	38,018	31,414	26,724	21,885	17,820	15,124											
NPV CADS OVER LOAN LIFE			186,180																	
DEBT SERVICE COVERAGE RATIOS:																				
DSCR TARGET GUIDELINES: 1.15-1.35																				
DSCR - ALL			3.82	4.36	4.07	3.88	3.61	3.35	3.20											
DSCR - SENIOR			3.82	4.36	4.07	3.88	3.61	3.35	3.20											
DSCR - SUBORDINATED			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!											
LOAN LIFE COVER RATIOS:																				
LLCR - ALL			7.26		LLCR TARGET GUIDELINES:				GOOD	BETTER										
LLCR - SENIOR			4.15		* Full Offtake, No Cross-Currency Risk:				1.20	1.30										
LLCR - SUBORDINATED			#DIV/0!		* Partial Offtake, No Cross-Currency Risk:				1.50	2.00										
PROJECT LIFE COVER RATIOS:																				
PLCR - ALL			6.44																	
DEBT TO EQUITY RATIO - D/E			2.33																	

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING

Input form for "Standard Projects"

PROJECT ECONOMICS SUMMARY

Client Name	PT Perkebunan Nusantara III
Project Number	1267-0001.000
Plant/Location	Sei Mangkie, Indonesia
Project Name	Biodiesel Feasibility Study
Task Name	Economic Analysis

Person Performing Economics:	N. Joshi
Date Last Revised	21-Aug-2008

ECONOMIC SUMMARY	Target	Max
IRR - %	65.2%	#NUM!
NPV - K$	134,552	-
DISC PAYBACK YRS	3.8	-

PROJECT TYPE: Revenue Growth

BRIEF PROJECT DESCRIPTION / REASON FOR PROJECT:

100,000 MT/year Biodiesel Refinery
10 MW (approximate) Biomass Waste-to-Energy Power Plant
Existing Crude Palm Oil (CPO) processing at PTPN-III's Sei Mangkie CPO Mill

CASE: This case represents the market convergence in 2015 of US$800/tonne CPO price and US$2,015/ton Biodiesel price plus sale of 80% Crude Glycerin at US$530/MT

CAPITAL & EXPENSE - K$:

Target:	2008	2009	2010	2011	Total
Capital	-	73,105.0	500.0	500.0	74,105.0
Computer Hardware	-	-	-	-	-
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Buildings	1,000.0	1,000.0	-	-	2,000.0
Engineering/Consulting	1,917.8	4,475.0	-	-	6,392.8
Startup	-	3,044.2	-	-	3,044.2
Dismantlement	-	-	-	-	-
Total NFI	**2,917.8**	**81,624.2**	**500.0**	**500.0**	**85,542.0**
Allocated U&S Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Max	2008	2009	2010	2011	Total
Capital	-	-	-	-	-
Computer Hardware	-				
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Building	-	-	-	-	-
FEE and Capital Services	-	-	-	-	-
Startup	-	-	-	-	-
Dismantlement	-	-	-	-	-
Total NFI	-	-	-		-
Allocated Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Project Release Date	Info only	6/1/2008
Project Spending Begins	Info only	6/1/2008
Project Startup		12/31/2009
Project Benefits Begin	info only	12/31/2009

PROJECT BENEFITS:

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING

Input form for "Standard Projects"

Revenue Growth Projects

Volume/Yr - kg

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Volume	-	-	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0
Product B Volume	-	-	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0
Product C Volume (MWh)	-	-	52,867.500	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5
Product D Volume	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod A *Methyl Ester*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Notes 2, 5 Raw Materials	0.000089	0.000089	0.000169	0.000249	0.000329	0.000409	0.000489	0.000569	0.000649	0.000729	0.000809	0.000889	0.000889
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Note 3 Conversion	0.0000179	0.0000184	0.0000189	0.0000195	0.0000201	0.0000207	0.0000213	0.0000220	0.0000226	0.0000233	0.0000240	0.0000247	0.0000254
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**

Increm Cost/unit Prod B *Technical Glycerin*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod C *Power to PLN*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod D -	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Low Tier Selling Price/unit
or Buy Price for Make vs. Buy Cases

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Price (k$/kg)	0.00123	0.00129	0.00135	0.00141	0.00147	0.00154	0.00161	0.00169	0.00176	0.00184	0.00193	0.002017	0.00211
Product B Price (k$/kg)	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053
Product C Price (k$/MWh)	0.05833	0.06008	0.06189	0.06374	0.06565	0.06762	0.06965	0.07174	0.07389	0.07611	0.07840	0.08075	0.08317
Product D Price	-	-	-	-	-	-	-	-	-	-	-	-	-

Royalty Pmts % of NSR	0%
Note 4 Working Capital % of Revenue	9.29%

Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

MAT: k$		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Note 4	Selling Expenses	-	-	4,325.4	4,514.1	4,711.4	4,917.7	5,133.5	5,359.1	5,595.1	5,841.8	6,099.9	6,369.7	6,652.0
Note 4	General & Admin Exp	-	-	33,161.7	34,608.1	36,120.7	37,702.5	39,356.6	41,086.5	42,895.5	44,787.3	46,765.7	48,834.7	50,998.3
Note 4	Other Expenses	-	-	5,767.3	6,018.8	6,281.9	6,557.0	6,844.6	7,145.5	7,460.1	7,789.1	8,133.2	8,493.0	8,869.3

KEY SENSITIVITIES:

Note 1: Incremental cost per unit for Product A includes costs for all Products A, B, and C.
Note 2: Raw materials costs based on Greenline Industries costs for methanol, methylate, ion resin recharge - CPO cost EXCLUDED = $89 per metric ton
Note 3: Conversion costs based on Indonesian labor, supervisory, maintenance, laboratory, and others at $17.85 per metric ton
Note 4: Costs estimated based on Annual Report Analysis

Growth Rate =	4.6%	Annual growth of biodiesel sales price
CPO 2008 Price =	0	US$/MT (CPO Basis)

Note 5: CPO Price is added to Raw Materials Cost in year 2009 then linearly decreased to $800/MT to 2019

Annual G&A	23%	of revenue
WACC =	16.4%	Weighted Average Cost of Capital (investment hurdle rate)

EXHIBIT "A" - INCREMENTAL INCOME STATEMENT - K$

PRIME ENGINEERING

PT Perkebunan Nusantara III	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
REVENUE:																				
NET SALES REVENUE	0	0	144182	150470	157047	163924	171116	178637	186502	194727	203329	212325	221732	221732	221732	221732	221732	221732	221732	221732
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NET REVENUE	0	0	144182	150470	157047	163924	171116	178637	186502	194727	203329	212325	221732	221732	221732	221732	221732	221732	221732	221732
MANUFACTURING COST:																				
COGS (EXCL DEP.)	0	0	18794	26851	34909	42969	51031	59095	67161	75229	83299	91371	91445	91445	91445	91445	91445	91445	91445	91445
TOTAL DEPRECIATION (SL)	0	14	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4984	57	57	57
PROJECT & START-UP EXP	1918	7519	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSURANCE & TAXES	0	731	736	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741	741
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	1918	8264	24527	32589	40648	48708	56770	64834	72900	80968	89037	97109	97184	97184	97184	97184	97170	92243	92243	92243
GROSS MARGIN	-1918	-8264	119654	117881	116399	115216	114346	113803	113602	113760	114292	115215	124548	124548	124548	124548	124562	129489	129489	129489
GROSS MARGIN-%	0%	0%	83%	78%	74%	70%	67%	64%	61%	58%	56%	54%	56%	56%	56%	56%	56%	58%	58%	58%
SELLING	0	0	4325	4514	4711	4918	5133	5359	5595	5842	6100	6370	6652	6652	6652	6652	6652	6652	6652	6652
GENERAL & ADMINISTRATIVE	0	0	33162	34608	36121	37702	39357	41086	42895	44787	46766	48835	50998	50998	50998	50998	50998	50998	50998	50998
OTHER EXPENSES	0	0	5767	6019	6282	6557	6845	7145	7460	7789	8133	8493	8869	8869	8869	8869	8869	8869	8869	8869
TOTAL MAT	0	0	43254	45141	47114	49177	51335	53591	55951	58418	60999	63697	66520	66520	66520	66520	66520	66520	66520	66520
OPERATING INCOME:	-1918	-8264	76400	72740	69285	66039	63011	60212	57652	55342	53293	51518	58029	58029	58029	58029	58042	62969	62969	62969
OTHER INCOME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-6287	-5635	-4914	-4117	-3236	-2263	-1188	0	0	0	0	0	0	0	0	0	0	0
INCOME BEFORE TAXES	-1918	-8264	82687	78375	74199	70156	66247	62475	58840	55342	53293	51518	58029	58029	58029	58029	58042	62969	62969	62969
TAXES ACCRUED	-575	-2479	24806	23512	22260	21047	19874	18743	17652	16602	15988	15455	17409	17409	17409	17409	17413	18891	18891	18891
NET INCOME:	-1342	-5785	57881	54862	51939	49109	46373	43733	41188	38739	37305	36062	40620	40620	40620	40620	40630	44078	44078	44078

PRIME ENGINEERING

EXHIBIT "B" - INCREMENTAL CASH FLOW - K$

PT Perkebunan Nusantara III

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
INCOME BEF TAXES:	-1918	-8264	82687	78375	74199	70156	66247	62475	58840	55342	53293	51518	58029	58029	58029	58029	58042	62969	62969	62969
BOOK DEPRECIATION	0	14	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4997	4984	57	57	57
OBSOLESCENCE (WRITE-OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-6287	-5635	-4914	-4117	-3236	-2263	-1188	0	0	0	0	0	0	0	0	0	0	0
PRE-TAX CASH INCOME	-1918	-8250	81397	77738	74282	71036	68009	65209	62649	60339	58290	56515	63026	63026	63026	63026	63026	63026	63026	63026
DEPRECIATION (FOR TAX):																				
BUILDING	0	0	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51	51
MACHINERY & EQUIPMENT	0	14821	23714	14228	8537	8537	4268	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL TAX DEPRECIATION	0	14821	23765	14279	8588	8588	4320	51	51	51	51	51	51	51	51	51	51	51	51	51
TAXES PAID	-575	-6921	17290	19037	19708	18734	19107	19547	18779	18086	17472	16939	18892	18892	18892	18892	18892	18892	18892	18892
SUBTOTAL:	-1342	-1329	64108	58700	54574	52302	48902	45662	43870	42253	40819	39576	44134	44134	44134	44134	44134	44134	44134	44134
CAPITAL EXPENDITURES:																				
LAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BUILDING	1000	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACHINERY & EQUIPMENT	0	73105	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PARTNER PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPEND.	1000	74105	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL WORKING CAPITAL	0	0	13394	13979	14590	15229	15897	16595	17326	18090	18889	19725	20599	20599	20599	20599	20599	20599	20599	20599
WORKING CAPITAL CHANGE	0	0	13394	584	611	639	668	699	731	764	799	836	874	0	0	0	0	0	0	0
ANNUAL CASH FLOW OPERATIONS	-2342	-75434	50213	57616	53963	51663	48234	44963	43139	41489	40020	38740	43260	44134	44134	44134	44134	44134	44134	44134
WORKING CAPITAL RECOVERY												0								
PERPETUITY VALUE												1	0	0	0	0	0	0	0	0
TOTAL ANNNUAL CASH FLOW	-2342	-75434	50213	57616	53963	51663	48234	44963	43139	41489	40020	38741	43260	44134	44134	44134	44134	44134	44134	44134
CUMULATIVE CASH FLOW	-2342	-77776	-27563	30053	84016	135679	183913	228876	272015	313504	353523	392265	435525	479658	523792	567926	612060	656193	700327	744461
DISCOUNT FACTORS	1.00	1.16	1.35	1.58	1.84	2.14	2.49	2.90	3.37	3.92	4.57	5.31	6.19	7.20	8.38	9.76	11.36	13.22	15.39	17.91
DISCOUNTED CASH FLOW	-2342	-64806	37060	36533	29396	24178	19392	15531	12801	10577	8765	7289	6993	6129	5265	4524	3886	3339	2868	2464
CUM DISC CASH FLOW	-2342	-67148	-30088	6445	35841	60019	79411	94942	107743	118320	127084	134374	141367	147496	152761	157284	161171	164509	167377	169842
NET PRESENT VALUE	134552																			
DISCOUNTED PAYBACK-YRS	3.8																			
	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IRR-%	65.2%																			

IRR and NPV Formulas must be reviewed to ensure that calculations are based on 10 years benefits after project startup

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
CASH FLOW AFTER DEBT SERVICE																				
TOTAL ANNUAL CASH FLOW	(2,342)	(75,434)	50,213	57,616	53,963	51,663	48,234	44,963	43,139	41,489	40,020	38,741	43,260	44,134	44,134	44,134	44,134	44,134	44,134	44,134
INTEREST PAYMENTS	0	0	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	0	0	0	0	0	0	0	0	0	0	0
CASH FROM COMBINED LOAN		59,879																		
TOTAL NET CASH FLOW	(2,342)	(15,554)	43,926	51,981	49,050	47,546	44,998	42,700	41,951	41,489	40,020	38,741	43,260	44,134	44,134	44,134	44,134	44,134	44,134	44,134
EFFECTIVE IRR-%	203.7%																			

Cash 9/23/2008

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PT Perkebunan Nusantara III

PRIME ENGINEERING

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
(A) SENIOR DEBT LEAD ARRANGER																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ 59,879.41			59,879	53,664	46,796	39,207	30,821	21,554	11,315											
INTEREST PAYMENTS (US$ '000)				(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)											
PRINCIPAL REPAYMENT (US$ '000)				(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)											
CLOSING BALANCE (US$ '000)				53,664	46,796	39,207	30,821	21,554	11,315	0											
DEBT SERVICE PAYMENT (US$ '000)				(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)											
(B) SENIOR DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	9.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(C) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(D) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	11.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
DEBT FACILITY COMBINED - ALL																					
OPENING BALANCE (US$ '000)		-	-	59,879	53,664	46,796	39,207	30,821	21,554	11,315	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	53,664	46,796	39,207	30,821	21,554	11,315	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
DEBT FACILITY COMBINED - SENIOR																					
OPENING BALANCE (US$ '000)		-	-	59,879	53,664	46,796	39,207	30,821	21,554	11,315	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(6,287)	(5,635)	(4,914)	(4,117)	(3,236)	(2,263)	(1,188)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(6,215)	(6,868)	(7,589)	(8,386)	(9,267)	(10,240)	(11,315)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	53,664	46,796	39,207	30,821	21,554	11,315	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PRIME ENGINEERING

DEBT FACILITY COMBINED - SUB																				
OPENING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE COVERAGE																				
CASH AVAIL. FOR DEBT SERVICE (CADS)	(2,342)	(75,434)	50,213	57,616	53,963	51,663	48,234	44,963	43,139	41,489	40,020	38,741	43,260	44,134	44,134	44,134	44,134	44,134	44,134	44,134
DISCOUNT RATE, BLENDED	10.5%																			
PERIOD	-	-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISCOUNTED CADS	(2,342)	(75,434)	50,213	52,141	44,195	38,291	32,352	27,293	23,697	20,625	18,004	15,773	15,939	14,716	13,318	12,052	10,907	9,870	8,933	8,084
NPV CADS OVER LOAN LIFE			268,182																	
NPV CADS OVER PROJECT LIFE			416,402																	
DEBT SERVICE PAYMENTS:																				
TOTAL (US$ '000)	-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
ALL SENIOR (US$ '000)	-	-	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	(12,503)	-	-	-	-	-	-	-	-	-	-	-
ALL SUBORDINATED (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SENIOR DEBT CADS:																				
CASH FLOW AVAIL FOR SENIOR DEBT			50,213	57,616	53,963	51,663	48,234	44,963	43,139											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SENIOR DEBT			50,213	52,141	44,195	38,291	32,352	27,293	23,697											
NPV CADS OVER LOAN LIFE			268,182																	
SUBORDINATED DEBT CADS:																				
CASH FLOW AVAIL FOR SUB DEBT			37,710	45,113	41,461	39,160	35,731	32,461	30,636											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SUB DEBT			37,710	40,826	33,956	29,024	23,966	19,704	16,829											
NPV CADS OVER LOAN LIFE			202,015																	
DEBT SERVICE COVERAGE RATIOS:																				
DSCR TARGET GUIDELINES: 1.15-1.35																				
DSCR - ALL			4.02	4.61	4.32	4.13	3.86	3.60	3.45											
DSCR - SENIOR			4.02	4.61	4.32	4.13	3.86	3.60	3.45											
DSCR - SUBORDINATED			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!											
LOAN LIFE COVER RATIOS:																				
LLCR - ALL			7.79																	
LLCR - SENIOR			4.41																	
LLCR - SUBORDINATED			#DIV/0!																	
PROJECT LIFE COVER RATIOS:																				
PLCR - ALL			6.89																	
DEBT TO EQUITY RATIO - D/E			2.33																	

LLCR TARGET GUIDELINES:	GOOD	BETTER
* Full Offtake, No Cross-Currency Risk:	1.20	1.30
* Partial Offtake, No Cross-Currency Risk:	1.50	2.00

Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

PROJECT ECONOMICS SUMMARY

Client Name	PT Perkebunan Nusantara III
Project Number	1267-0001.000
Plant/Location	Sei Mangkie, Indonesia
Project Name	Biodiesel Feasibility Study
Task Name	Economic Analysis

Person Performing Economics:	N. Joshi
Date Last Revised	14-Sep-2008

ECONOMIC SUMMARY	Target	Max
IRR - %	23.8%	#NUM!
NPV - K$	17,751	-
DISC PAYBACK YRS	9.5	-

PROJECT TYPE: Revenue Growth

BRIEF PROJECT DESCRIPTION / REASON FOR PROJECT:

100,000 MT/year Biodiesel Refinery
10 MW (approximate) Biomass Waste-to-Energy Power Plant
Existing Crude Palm Oil (CPO) processing at PTPN-III's Sei Mangkie CPO Mill

CASE: This case represents economics calculated for the Biodiesel Plant only, including sales of glycerin and transfer pricing of CPO at US$850/tonne. This is the "incremental benefit" case (incremental benefit to PTPN of converting saleable CPO to Biodiesel).

CAPITAL & EXPENSE - K$:

Target:	**2008**	**2009**	**2010**	**2011**	**Total**
Capital	-	36,830.0	250.0	250.0	37,330.0
Computer Hardware	-	-	-	-	-
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Buildings	500.0	500.0	-	-	1,000.0
Engineering/Consulting	965.9	2,253.8	-	-	3,219.7
Startup	-	1,533.2	-	-	1,533.2
Dismantlement	-	-	-	-	-
Total NFI	**1,465.9**	**41,117.0**	**250.0**	**250.0**	**43,082.9**
Allocated U&S Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Max	**2008**	**2009**	**2010**	**2011**	**Total**
Capital	-	-	-	-	-
Computer Hardware	-				
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Building	-	-	-	-	-
FEE and Capital Services	-	-	-	-	-
Startup	-	-	-	-	-
Dismantlement	-	-	-	-	-
Total NFI	-	-	-		-
Allocated Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Project Release Date	Info only	6/1/2008
Project Spending Begins	Info only	6/1/2008
Project Startup		12/31/2009
Project Benefits Begin	info only	12/31/2009

PROJECT BENEFITS:

52867.5

Data Input Section

Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

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Revenue Growth Projects

Volume/Yr - kg

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Volume	-	-	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0
Product B Volume	-	-	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0
Product C Volume (MWh)	-	-	-	-	-	-	-	-	-	-	-	-	-
Product D Volume	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod A *Methyl Ester*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Notes 2, 5 Raw Materials	0.000089	0.000939	0.000934	0.000929	0.000924	0.000919	0.000914	0.000909	0.000904	0.000899	0.000894	0.000889	0.000889
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Note 3 Conversion	0.0000179	0.0000184	0.0000189	0.0000195	0.0000201	0.0000207	0.0000213	0.0000220	0.0000226	0.0000233	0.0000240	0.0000247	0.0000254
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**

Increm Cost/unit Prod B *Technical Glycerin*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod C *Power to PLN*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod D -	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Low Tier Selling Price/unit or Buy Price for Make vs. Buy Cases

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Price (k$/kg)	0.00123	0.00129	0.00135	0.00141	0.00147	0.00154	0.00161	0.00169	0.00176	0.00184	0.00193	0.002017	0.00211
Product B Price (k$/kg)	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053
Product C Price (k$/MWh)	0.05833	0.06008	0.06189	0.06374	0.06565	0.06762	0.06965	0.07174	0.07389	0.07611	0.07840	0.08075	0.08317
Product D Price	-	-	-	-	-	-	-	-	-	-	-	-	-

Royalty Pmts % of NSR	0%
Note 4 Working Capital % of Revenue	9.29%

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

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MAT: k$	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Note 4 Selling Expenses	-	-	4,227.3	4,413.0	4,607.3	4,810.5	5,023.0	5,245.3	5,477.9	5,721.1	5,975.5	6,241.7	6,520.0
Note 4 General & Admin Exp	-	-	32,409.2	33,833.1	35,322.4	36,880.2	38,509.7	40,214.1	41,997.0	43,861.8	45,812.4	47,852.8	49,987.0
Note 4 Other Expenses	-	-	5,636.4	5,884.0	6,143.0	6,413.9	6,697.3	6,993.8	7,303.8	7,628.1	7,967.4	8,322.2	8,693.4

KEY SENSITIVITIES:

Note 1: Incremental cost per unit for Product A includes costs for all Products A, B, and C.
Note 2: Raw materials costs based on Greenline Industries costs for methanol, methylate, ion resin recharge - CPO cost EXCLUDED = $89 per metric ton
Note 3: Conversion costs based on Indonesian labor, supervisory, maintenance, laboratory, and others at $17.85 per metric ton
Note 4: Costs estimated based on Annual Report Analysis

Growth Rate = 4.6% Annual growth of biodiesel sales price

CPO 2008 Price = 850 US$/MT (CPO Basis)
Note 5: CPO Price is added to Raw Materials Cost in year 2009 then linearly decreased to $800/MT to 2019

Annual G&A 23% of revenue

WACC = 16.4% Weighted Average Cost of Capital (investment hurdle rate)

EXHIBIT "A" - INCREMENTAL INCOME STATEMENT - K$

PRIME ENGINEERING

PT Perkebunan Nusantara III	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
REVENUE:																				
NET SALES REVENUE	0	0	140910	147100	153576	160349	167433	174844	182595	190704	199185	208056	217335	217335	217335	217335	217335	217335	217335	217335
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NET REVENUE	0	0	140910	147100	153576	160349	167433	174844	182595	190704	199185	208056	217335	217335	217335	217335	217335	217335	217335	217335
MANUFACTURING COST:																				
COGS (EXCL DEP.)	0	0	95294	94851	94409	93969	93531	93095	92661	92229	91799	91371	91445	91445	91445	91445	91445	91445	91445	91445
TOTAL DEPRECIATION (SL)	0	7	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2510	29	29	29
PROJECT & START-UP EXP	966	3787	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSURANCE & TAXES	0	368	371	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373	373
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	966	4162	98182	97741	97300	96860	96422	95986	95552	95120	94689	94261	94336	94336	94336	94336	94329	91847	91847	91847
GROSS MARGIN	-966	-4162	42728	49359	56276	63489	71011	78858	87044	95584	104495	113794	122999	122999	122999	122999	123006	125488	125488	125488
GROSS MARGIN-%	0%	0%	30%	34%	37%	40%	42%	45%	48%	50%	52%	55%	57%	57%	57%	57%	57%	58%	58%	58%
SELLING	0	0	4227	4413	4607	4810	5023	5245	5478	5721	5976	6242	6520	6520	6520	6520	6520	6520	6520	6520
GENERAL & ADMINISTRATIVE	0	0	32409	33833	35322	36880	38510	40214	41997	43862	45812	47853	49987	49987	49987	49987	49987	49987	49987	49987
OTHER EXPENSES	0	0	5636	5884	6143	6414	6697	6994	7304	7628	7967	8322	8693	8693	8693	8693	8693	8693	8693	8693
TOTAL MAT	0	0	42273	44130	46073	48105	50230	52453	54779	57211	59755	62417	65200	65200	65200	65200	65200	65200	65200	65200
OPERATING INCOME:	-966	-4162	455	5229	10203	15384	20781	26405	32265	38373	44740	51378	57799	57799	57799	57799	57806	60288	60288	60288
OTHER INCOME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-3167	-2838	-2475	-2073	-1630	-1140	-598	0	0	0	0	0	0	0	0	0	0	0
INCOME BEFORE TAXES	-966	-4162	3622	8067	12678	17458	22411	27545	32863	38373	44740	51378	57799	57799	57799	57799	57806	60288	60288	60288
TAXES ACCRUED	-290	-1249	1087	2420	3803	5237	6723	8263	9859	11512	13422	15413	17340	17340	17340	17340	17342	18086	18086	18086
NET INCOME:	-676	-2914	2535	5647	8875	12220	15688	19281	23004	26861	31318	35964	40459	40459	40459	40459	40464	42201	42201	42201

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EXHIBIT "B" - INCREMENTAL CASH FLOW - K$

PT Perkebunan Nusantara III

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
INCOME BEF TAXES:	-966	-4162	3622	8067	12678	17458	22411	27545	32863	38373	44740	51378	57799	57799	57799	57799	57806	60288	60288	60288
BOOK DEPRECIATION	0	7	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2510	29	29	29
OBSOLESCENCE (WRITE-OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-3167	-2838	-2475	-2073	-1630	-1140	-598	0	0	0	0	0	0	0	0	0	0	0
PRE-TAX CASH INCOME	-966	-4155	2972	7746	12721	17901	23299	28922	34782	40890	47257	53895	60316	60316	60316	60316	60316	60316	60316	60316
DEPRECIATION (FOR TAX):																				
BUILDING	0	0	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
MACHINERY & EQUIPMENT	0	7466	11946	7167	4300	4300	2150	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL TAX DEPRECIATION	0	7466	11971	7193	4326	4326	2176	26	26	26	26	26	26	26	26	26	26	26	26	26
TAXES PAID	-290	-3486	-2700	166	2518	4073	6337	8669	10427	12259	14169	16161	18087	18087	18087	18087	18087	18087	18087	18087
SUBTOTAL:	-676	-669	5672	7580	10202	13829	16962	20253	24355	28631	33088	37734	42229	42229	42229	42229	42229	42229	42229	42229
CAPITAL EXPENDITURES:																				
LAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BUILDING	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACHINERY & EQUIPMENT	0	36830	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PARTNER PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPEND.	500	37330	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL WORKING CAPITAL	0	0	13091	13666	14267	14896	15555	16243	16963	17716	18504	19328	20190	20190	20190	20190	20190	20190	20190	20190
WORKING CAPITAL CHANGE	0	0	13091	575	602	629	658	688	720	753	788	824	862	0	0	0	0	0	0	0
ANNUAL CASH FLOW OPERATIONS	-1176	-37999	-7669	6755	9601	13200	16304	19565	23635	27878	32300	36910	41367	42229	42229	42229	42229	42229	42229	42229
WORKING CAPITAL RECOVERY												0								
PERPETUITY VALUE												1	0	0	0	0	0	0	0	0
TOTAL ANNNUAL CASH FLOW	-1176	-37999	-7669	6755	9601	13200	16304	19565	23635	27878	32300	36911	41367	42229	42229	42229	42229	42229	42229	42229
CUMULATIVE CASH FLOW	-1176	-39175	-46844	-40088	-30488	-17288	-984	18580	42216	70093	102393	139304	180671	222900	265129	307358	349587	391816	434045	476274
DISCOUNT FACTORS	1.00	1.16	1.35	1.58	1.84	2.14	2.49	2.90	3.37	3.92	4.57	5.31	6.19	7.20	8.38	9.76	11.36	13.22	15.39	17.91
DISCOUNTED CASH FLOW	-1176	-32645	-5660	4283	5230	6177	6555	6758	7014	7107	7074	6945	6687	5864	5038	4328	3718	3195	2744	2358
CUM DISC CASH FLOW	-1176	-33821	-39481	-35198	-29968	-23791	-17236	-10478	-3464	3642	10716	17661	24348	30213	35251	39579	43298	46492	49237	51594
NET PRESENT VALUE	17751																			
DISCOUNTED PAYBACK-YRS	9.5																			
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IRR-%	23.8%																			

IRR and NPV Formulas must be reviewed to ensure that calculations are based on 10 years benefits after project startup

CASH FLOW AFTER DEBT SERVICE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
TOTAL ANNUAL CASH FLOW	(1,176)	(37,999)	(7,669)	6,755	9,601	13,200	16,304	19,565	23,635	27,878	32,300	36,911	41,367	42,229	42,229	42,229	42,229	42,229	42,229	42,229
INTEREST PAYMENTS	0	0	(3,167)	(2,838)	(2,475)	(2,073)	(1,630)	(1,140)	(598)	0	0	0	0	0	0	0	0	0	0	0
CASH FROM COMBINED LOAN		30,158																		
TOTAL NET CASH FLOW	(1,176)	(7,841)	(10,835)	3,917	7,126	11,126	14,674	18,425	23,037	27,878	32,300	36,911	41,367	42,229	42,229	42,229	42,229	42,229	42,229	42,229
EFFECTIVE IRR-%	43.5%																			

Cash 9/23/2008

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PT Perkebunan Nusantara III

PRIME ENGINEERING

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
(A) SENIOR DEBT LEAD ARRANGER																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ 30,158.04			30,158	27,028	23,569	19,746	15,523	10,856	5,699											
INTEREST PAYMENTS (US$ '000)				(3,167)	(2,838)	(2,475)	(2,073)	(1,630)	(1,140)	(598)											
PRINCIPAL REPAYMENT (US$ '000)				(3,130)	(3,459)	(3,822)	(4,224)	(4,667)	(5,157)	(5,699)											
CLOSING BALANCE (US$ '000)				27,028	23,569	19,746	15,523	10,856	5,699	0											
DEBT SERVICE PAYMENT (US$ '000)				(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)											
(B) SENIOR DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	9.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(C) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(D) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	11.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
DEBT FACILITY COMBINED - ALL																					
OPENING BALANCE (US$ '000)		-	-	30,158	27,028	23,569	19,746	15,523	10,856	5,699	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(3,167)	(2,838)	(2,475)	(2,073)	(1,630)	(1,140)	(598)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(3,130)	(3,459)	(3,822)	(4,224)	(4,667)	(5,157)	(5,699)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	27,028	23,569	19,746	15,523	10,856	5,699	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	-	-	-	-	-	-	-	-	-	-	-
DEBT FACILITY COMBINED - SENIOR																					
OPENING BALANCE (US$ '000)		-	-	30,158	27,028	23,569	19,746	15,523	10,856	5,699	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(3,167)	(2,838)	(2,475)	(2,073)	(1,630)	(1,140)	(598)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(3,130)	(3,459)	(3,822)	(4,224)	(4,667)	(5,157)	(5,699)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	27,028	23,569	19,746	15,523	10,856	5,699	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	-	-	-	-	-	-	-	-	-	-	-

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PRIME ENGINEERING

DEBT FACILITY COMBINED - SUB																				
OPENING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE COVERAGE																				
CASH AVAIL. FOR DEBT SERVICE (CADS)	(1,176)	(37,999)	(7,669)	6,755	9,601	13,200	16,304	19,565	23,635	27,878	32,300	36,911	41,367	42,229	42,229	42,229	42,229	42,229	42,229	42,229
DISCOUNT RATE, BLENDED	10.5%																			
PERIOD	-	-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISCOUNTED CADS	(1,176)	(37,999)	(7,669)	6,113	7,863	9,783	10,935	11,876	12,983	13,859	14,531	15,028	15,242	14,081	12,743	11,532	10,436	9,444	8,547	7,735
NPV CADS OVER LOAN LIFE			51,885																	
NPV CADS OVER PROJECT LIFE			185,062																	
DEBT SERVICE PAYMENTS:																				
TOTAL (US$ '000)	-	-	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	-	-	-	-	-	-	-	-	-	-	-
ALL SENIOR (US$ '000)	-	-	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	-	-	-	-	-	-	-	-	-	-	-
ALL SUBORDINATED (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SENIOR DEBT CADS:																				
CASH FLOW AVAIL FOR SENIOR DEBT			SHORT	6,755	9,601	13,200	16,304	19,565	23,635											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SENIOR DEBT			-	6,113	7,863	9,783	10,935	11,876	12,983											
NPV CADS OVER LOAN LIFE			59,554																	
SUBORDINATED DEBT CADS:																				
CASH FLOW AVAIL FOR SUB DEBT			SHORT	458	3,304	6,903	10,007	13,268	17,338											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SUB DEBT			-	415	2,706	5,116	6,712	8,054	9,524											
NPV CADS OVER LOAN LIFE			32,526																	
DEBT SERVICE COVERAGE RATIOS:																				
DSCR TARGET GUIDELINES: 1.15-1.35																				
DSCR - ALL			(1.22)	1.07	1.52	2.10	2.59	3.11	3.75											
DSCR - SENIOR			(1.22)	1.07	1.52	2.10	2.59	3.11	3.75											
DSCR - SUBORDINATED			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!											
LOAN LIFE COVER RATIOS:																				
LLCR - ALL			2.99																	
LLCR - SENIOR			1.91																	
LLCR - SUBORDINATED			#DIV/0!																	
PROJECT LIFE COVER RATIOS:																				
PLCR - ALL			6.07																	
DEBT TO EQUITY RATIO - D/E			2.33																	

LLCR TARGET GUIDELINES:	GOOD	BETTER
* Full Offtake, No Cross-Currency Risk:	1.20	1.30
* Partial Offtake, No Cross-Currency Risk:	1.50	2.00

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

PROJECT ECONOMICS SUMMARY

Client Name	PT Perkebunan Nusantara III
Project Number	1267-0001.000
Plant/Location	Sei Mangkie, Indonesia
Project Name	Biodiesel Feasibility Study
Task Name	Economic Analysis

Person Performing Economics:	N. Joshi
Date Last Revised	14-Sep-2008

ECONOMIC SUMMARY	Target	Max
IRR - %	119.9%	#NUM!
NPV - K$	156,667	-
DISC PAYBACK YRS	3.0	-

PROJECT TYPE: Revenue Growth

BRIEF PROJECT DESCRIPTION / REASON FOR PROJECT:

100,000 MT/year Biodiesel Refinery
10 MW (approximate) Biomass Waste-to-Energy Power Plant
Existing Crude Palm Oil (CPO) processing at PTPN-III's Sei Mangkie CPO Mill

CASE: This case represents economics calculated for the Biodiesel Plant only, including sales of glycerin and zero transfer pricing of CPO. This is the "cash flow coverage" case (ability of project to generate cash for servicing debt).

CAPITAL & EXPENSE - K$:

Target:	2008	2009	2010	2011	Total
Capital	-	36,830.0	250.0	250.0	37,330.0
Computer Hardware	-	-	-	-	-
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Buildings	500.0	500.0	-	-	1,000.0
Engineering/Consulting	965.9	2,253.8	-	-	3,219.7
Startup	-	1,533.2	-	-	1,533.2
Dismantlement	-	-	-	-	-
Total NFI	**1,465.9**	**41,117.0**	**250.0**	**250.0**	**43,082.9**
Allocated U&S Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Max	2008	2009	2010	2011	Total
Capital	-	-	-	-	-
Computer Hardware	-				
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Building	-	-	-	-	-
FEE and Capital Services	-	-	-	-	-
Startup	-	-	-	-	-
Dismantlement	-	-	-	-	-
Total NFI	-	-	-		-
Allocated Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Project Release Date	Info only	6/1/2008
Project Spending Begins	Info only	6/1/2008
Project Startup		12/31/2009
Project Benefits Begin	info only	12/31/2009

PROJECT BENEFITS:

52867.5

Input form for "Standard Projects"

Data Input Section

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

Revenue Growth Projects

Volume/Yr - kg

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Volume	-	-	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0	100,000,000.0
Product B Volume	-	-	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0	11,950,000.0
Product C Volume (MWh)	-	-	-	-	-	-	-	-	-	-	-	-	-
Product D Volume	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod A *Methyl Ester*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Notes 2, 5 Raw Materials	0.000089	0.000089	0.000169	0.000249	0.000329	0.000409	0.000489	0.000569	0.000649	0.000729	0.000809	0.000889	0.000889
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Note 3 Conversion	0.0000179	0.0000184	0.0000189	0.0000195	0.0000201	0.0000207	0.0000213	0.0000220	0.0000226	0.0000233	0.0000240	0.0000247	0.0000254
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**

Increm Cost/unit Prod B *Technical Glycerin*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod C *Power to PLN*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod D -	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Low Tier Selling Price/unit or Buy Price for Make vs. Buy Cases

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Price (k$/kg)	0.00123	0.00129	0.00135	0.00141	0.00147	0.00154	0.00161	0.00169	0.00176	0.00184	0.00193	0.002017	0.00211
Product B Price (k$/kg)	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053
Product C Price (k$/MWh)	0.05833	0.06008	0.06189	0.06374	0.06565	0.06762	0.06965	0.07174	0.07389	0.07611	0.07840	0.08075	0.08317
Product D Price	-	-	-	-	-	-	-	-	-	-	-	-	-

Royalty Pmts % of NSR	0%
Note 4 Working Capital % of Revenue	9.29%

Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING

	MAT: k$	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Note 4	Selling Expenses	-	-	4,227.3	4,413.0	4,607.3	4,810.5	5,023.0	5,245.3	5,477.9	5,721.1	5,975.5	6,241.7	6,520.0
Note 4	General & Admin Exp	-	-	32,409.2	33,833.1	35,322.4	36,880.2	38,509.7	40,214.1	41,997.0	43,861.8	45,812.4	47,852.8	49,987.0
Note 4	Other Expenses	-	-	5,636.4	5,884.0	6,143.0	6,413.9	6,697.3	6,993.8	7,303.8	7,628.1	7,967.4	8,322.2	8,693.4

KEY SENSITIVITIES:

Note 1: Incremental cost per unit for Product A includes costs for all Products A, B, and C.
Note 2: Raw materials costs based on Greenline Industries costs for methanol, methylate, ion resin recharge - CPO cost EXCLUDED = $89 per metric ton
Note 3: Conversion costs based on Indonesian labor, supervisory, maintenance, laboratory, and others at $17.85 per metric ton
Note 4: Costs estimated based on Annual Report Analysis

Growth Rate = 4.6% Annual growth of biodiesel sales price

CPO 2008 Price = 0 US$/MT (CPO Basis)
Note 5: CPO Price is added to Raw Materials Cost in year 2009 then linearly decreased to $800/MT to 2019

Annual G&A 23% of revenue

WACC = 16.4% Weighted Average Cost of Capital (investment hurdle rate)

EXHIBIT "A" - INCREMENTAL INCOME STATEMENT - K$

PRIME ENGINEERING

PT Perkebunan Nusantara III	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
REVENUE:										
NET SALES REVENUE	0	0	140910	147100	153576	160349	167433	174844	182595	190704
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0
NET REVENUE	0	0	140910	147100	153576	160349	167433	174844	182595	190704
MANUFACTURING COST:										
COGS (EXCL DEP.)	0	0	18794	26851	34909	42969	51031	59095	67161	75229
TOTAL DEPRECIATION (SL)	0	7	2517	2517	2517	2517	2517	2517	2517	2517
PROJECT & START-UP EXP	966	3787	0	0	0	0	0	0	0	0
INSURANCE & TAXES	0	368	371	373	373	373	373	373	373	373
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	966	4162	21682	29741	37800	45860	53922	61986	70052	78120
GROSS MARGIN	-966	-4162	119228	117359	115776	114489	113511	112858	112544	112584
GROSS MARGIN-%	0%	0%	85%	80%	75%	71%	68%	65%	62%	59%
SELLING	0	0	4227	4413	4607	4810	5023	5245	5478	5721
GENERAL & ADMINISTRATIVE	0	0	32409	33833	35322	36880	38510	40214	41997	43862
OTHER EXPENSES	0	0	5636	5884	6143	6414	6697	6994	7304	7628
TOTAL MAT	0	0	42273	44130	46073	48105	50230	52453	54779	57211
OPERATING INCOME:	-966	-4162	76955	73229	69703	66384	63281	60405	57765	55373
OTHER INCOME	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-3167	-2838	-2475	-2073	-1630	-1140	-598	0
INCOME BEFORE TAXES	-966	-4162	80122	76067	72178	68458	64911	61545	58363	55373
TAXES ACCRUED	-290	-1249	24037	22820	21653	20537	19473	18463	17509	16612
NET INCOME:	-676	-2914	56085	53247	50525	47920	45438	43081	40854	38761

PT Perkebunan Nusantara III	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
REVENUE:										
NET SALES REVENUE	199185	208056	217335	217335	217335	217335	217335	217335	217335	217335
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0
NET REVENUE	199185	208056	217335	217335	217335	217335	217335	217335	217335	217335
MANUFACTURING COST:										
COGS (EXCL DEP.)	83299	91371	91445	91445	91445	91445	91445	91445	91445	91445
TOTAL DEPRECIATION (SL)	2517	2517	2517	2517	2517	2517	2510	29	29	29
PROJECT & START-UP EXP	0	0	0	0	0	0	0	0	0	0
INSURANCE & TAXES	373	373	373	373	373	373	373	373	373	373
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	86189	94261	94336	94336	94336	94336	94329	91847	91847	91847
GROSS MARGIN	112995	113794	122999	122999	122999	122999	123006	125488	125488	125488
GROSS MARGIN-%	57%	55%	57%	57%	57%	57%	57%	58%	58%	58%
SELLING	5976	6242	6520	6520	6520	6520	6520	6520	6520	6520
GENERAL & ADMINISTRATIVE	45812	47853	49987	49987	49987	49987	49987	49987	49987	49987
OTHER EXPENSES	7967	8322	8693	8693	8693	8693	8693	8693	8693	8693
TOTAL MAT	59755	62417	65200	65200	65200	65200	65200	65200	65200	65200
OPERATING INCOME:	53240	51378	57799	57799	57799	57799	57806	60288	60288	60288
OTHER INCOME	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	0	0	0	0	0	0	0	0
INCOME BEFORE TAXES	53240	51378	57799	57799	57799	57799	57806	60288	60288	60288
TAXES ACCRUED	15972	15413	17340	17340	17340	17340	17342	18086	18086	18086
NET INCOME:	37268	35964	40459	40459	40459	40459	40464	42201	42201	42201

PRIME ENGINEERING

EXHIBIT "B" - INCREMENTAL CASH FLOW - K$

PT Perkebunan Nusantara III

PT Perkebunan Nusantara III	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
INCOME BEF TAXES:	-966	-4162	80122	76067	72178	68458	64911	61545	58363	55373	53240	51378	57799	57799	57799	57799	57806	60288	60288	60288
BOOK DEPRECIATION	0	7	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2517	2510	29	29	29
OBSOLESCENCE (WRITE-OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-3167	-2838	-2475	-2073	-1630	-1140	-598	0	0	0	0	0	0	0	0	0	0	0
PRE-TAX CASH INCOME	-966	-4155	79472	75746	72221	68901	65799	62922	60282	57890	55757	53895	60316	60316	60316	60316	60316	60316	60316	60316
DEPRECIATION (FOR TAX):																				
BUILDING	0	0	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
MACHINERY & EQUIPMENT	0	7466	11946	7167	4300	4300	2150	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL TAX DEPRECIATION	0	7466	11971	7193	4326	4326	2176	26	26	26	26	26	26	26	26	26	26	26	26	26
TAXES PAID	-290	-3486	20250	20566	20368	19373	19087	18869	18077	17359	16719	16161	18087	18087	18087	18087	18087	18087	18087	18087
SUBTOTAL:	-676	-669	59222	55180	51852	49529	46712	44053	42205	40531	39038	37734	42229	42229	42229	42229	42229	42229	42229	42229
CAPITAL EXPENDITURES:																				
LAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BUILDING	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACHINERY & EQUIPMENT	0	36830	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PARTNER PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPEND.	500	37330	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL WORKING CAPITAL	0	0	13091	13666	14267	14896	15555	16243	16963	17716	18504	19328	20190	20190	20190	20190	20190	20190	20190	20190
WORKING CAPITAL CHANGE	0	0	13091	575	602	629	658	688	720	753	788	824	862	0	0	0	0	0	0	0
ANNUAL CASH FLOW OPERATIONS	-1176	-37999	45881	54355	51251	48900	46054	43365	41485	39778	38250	36910	41367	42229	42229	42229	42229	42229	42229	42229
WORKING CAPITAL RECOVERY												0								
PERPETUITY VALUE												1	0	0	0	0	0	0	0	0
TOTAL ANNNUAL CASH FLOW	-1176	-37999	45881	54355	51251	48900	46054	43365	41485	39778	38250	36911	41367	42229	42229	42229	42229	42229	42229	42229
CUMULATIVE CASH FLOW	-1176	-39175	6706	61062	112312	161212	207266	250630	292116	331893	370143	407054	448421	490650	532879	575108	617337	659566	701795	744024
DISCOUNT FACTORS	1.00	1.16	1.35	1.58	1.84	2.14	2.49	2.90	3.37	3.92	4.57	5.31	6.19	7.20	8.38	9.76	11.36	13.22	15.39	17.91
DISCOUNTED CASH FLOW	-1176	-32645	33863	34465	27918	22884	18516	14978	12310	10141	8377	6945	6687	5864	5038	4328	3718	3195	2744	2358
CUM DISC CASH FLOW	-1176	-33821	42	34508	62426	85310	103826	118805	131115	141255	149633	156578	163264	169129	174167	178495	182214	185408	188153	190511
NET PRESENT VALUE	156667																			
DISCOUNTED PAYBACK-YRS	3.0																			
	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IRR-%	119.9%																			

IRR and NPV Formulas must be reviewed to ensure that calculations are based on 10 years benefits after project startup

CASH FLOW AFTER DEBT SERVICE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
TOTAL ANNUAL CASH FLOW	(1,176)	(37,999)	45,881	54,355	51,251	48,900	46,054	43,365	41,485	39,778	38,250	36,911	41,367	42,229	42,229	42,229	42,229	42,229	42,229	42,229
INTEREST PAYMENTS	0	0	(3,167)	(2,838)	(2,475)	(2,073)	(1,630)	(1,140)	(598)	0	0	0	0	0	0	0	0	0	0	0
CASH FROM COMBINED LOAN		30,158																		
TOTAL NET CASH FLOW	(1,176)	(7,841)	42,715	51,517	48,776	46,826	44,424	42,225	40,887	39,778	38,250	36,911	41,367	42,229	42,229	42,229	42,229	42,229	42,229	42,229
EFFECTIVE IRR-%	341.7%																			

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PT Perkebunan Nusantara III

PRIME ENGINEERING

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
(A) SENIOR DEBT LEAD ARRANGER																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ 30,158.04			30,158	27,028	23,569	19,746	15,523	10,856	5,699											
INTEREST PAYMENTS (US$ '000)				(3,167)	(2,838)	(2,475)	(2,073)	(1,630)	(1,140)	(598)											
PRINCIPAL REPAYMENT (US$ '000)				(3,130)	(3,459)	(3,822)	(4,224)	(4,667)	(5,157)	(5,699)											
CLOSING BALANCE (US$ '000)				27,028	23,569	19,746	15,523	10,856	5,699	0											
DEBT SERVICE PAYMENT (US$ '000)				(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)											
(B) SENIOR DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	9.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(C) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(D) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	11.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
DEBT FACILITY COMBINED - ALL																					
OPENING BALANCE (US$ '000)		-	-	30,158	27,028	23,569	19,746	15,523	10,856	5,699	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(3,167)	(2,838)	(2,475)	(2,073)	(1,630)	(1,140)	(598)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(3,130)	(3,459)	(3,822)	(4,224)	(4,667)	(5,157)	(5,699)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	27,028	23,569	19,746	15,523	10,856	5,699	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	-	-	-	-	-	-	-	-	-	-	-
DEBT FACILITY COMBINED - SENIOR																					
OPENING BALANCE (US$ '000)		-	-	30,158	27,028	23,569	19,746	15,523	10,856	5,699	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(3,167)	(2,838)	(2,475)	(2,073)	(1,630)	(1,140)	(598)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(3,130)	(3,459)	(3,822)	(4,224)	(4,667)	(5,157)	(5,699)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	27,028	23,569	19,746	15,523	10,856	5,699	0	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	-	-	-	-	-	-	-	-	-	-	-

PRIME ENGINEERING

EXHIBIT "C" - DEBT SERVICE ANALYSIS

DEBT FACILITY COMBINED - SUB																				
OPENING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE COVERAGE																				
CASH AVAIL. FOR DEBT SERVICE (CADS)	(1,176)	(37,999)	45,881	54,355	51,251	48,900	46,054	43,365	41,485	39,778	38,250	36,911	41,367	42,229	42,229	42,229	42,229	42,229	42,229	42,229
DISCOUNT RATE, BLENDED	10.5%																			
PERIOD	-	-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISCOUNTED CADS	(1,176)	(37,999)	45,881	49,190	41,973	36,243	30,890	26,322	22,789	19,774	17,208	15,028	15,242	14,081	12,743	11,532	10,436	9,444	8,547	7,735
NPV CADS OVER LOAN LIFE			253,289																	
NPV CADS OVER PROJECT LIFE			395,058																	
DEBT SERVICE PAYMENTS:																				
TOTAL (US$ '000)	-	-	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	-	-	-	-	-	-	-	-	-	-	-
ALL SENIOR (US$ '000)	-	-	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	(6,297)	-	-	-	-	-	-	-	-	-	-	-
ALL SUBORDINATED (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SENIOR DEBT CADS:																				
CASH FLOW AVAIL FOR SENIOR DEBT			45,881	54,355	51,251	48,900	46,054	43,365	41,485											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SENIOR DEBT			45,881	49,190	41,973	36,243	30,890	26,322	22,789											
NPV CADS OVER LOAN LIFE			253,289																	
SUBORDINATED DEBT CADS:																				
CASH FLOW AVAIL FOR SUB DEBT			39,585	48,058	44,954	42,603	39,757	37,068	35,188											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SUB DEBT			39,585	43,492	36,816	31,575	26,666	22,500	19,330											
NPV CADS OVER LOAN LIFE			219,964																	
DEBT SERVICE COVERAGE RATIOS:																				
DSCR TARGET GUIDELINES: 1.15-1.35																				
DSCR - ALL			7.29	8.63	8.14	7.77	7.31	6.89	6.59											
DSCR - SENIOR			7.29	8.63	8.14	7.77	7.31	6.89	6.59											
DSCR - SUBORDINATED			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!											
LOAN LIFE COVER RATIOS:																				
LLCR - ALL			15.63		LLCR TARGET GUIDELINES:				GOOD	BETTER										
LLCR - SENIOR			8.33		• Full Offtake, No Cross-Currency Risk:				1.20	1.30										
LLCR - SUBORDINATED			#DIV/0!		• Partial Offtake, No Cross-Currency Risk:				1.50	2.00										
PROJECT LIFE COVER RATIOS:																				
PLCR - ALL			13.03																	
DEBT TO EQUITY RATIO - D/E			2.33																	

Data Input Section

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

PROJECT ECONOMICS SUMMARY

Client Name	PT Perkebunan Nusantara III
Project Number	1267-0001.000
Plant/Location	Sei Mangkie, Indonesia
Project Name	Biodiesel Feasibility Study
Task Name	Economic Analysis

Person Performing Economics:	N. Joshi
Date Last Revised	14-Sep-2008

ECONOMIC SUMMARY	Target	Max
IRR - %	-9.1%	#NUM!
NPV - K$	(22,115)	-
DISC PAYBACK YRS	-	-

PROJECT TYPE: Revenue Growth

BRIEF PROJECT DESCRIPTION / REASON FOR PROJECT:

100,000 MT/year Biodiesel Refinery
10 MW (approximate) Biomass Waste-to-Energy Power Plant
Existing Crude Palm Oil (CPO) processing at PTPN-III's Sei Mangkie CPO Mill

CASE: This case represents economics of the Biomass-to-Energy power plant including only the sale of power to PLN. Raw material costs and labor are fully burdened by the Biodiesel plant.

CAPITAL & EXPENSE - K$:

Target:	2008	2009	2010	2011	Total
Capital	-	36,275.0	250.0	250.0	36,775.0
Computer Hardware	-	-	-	-	-
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Buildings	500.0	500.0	-	-	1,000.0
Engineering/Consulting	951.9	2,221.2	-	-	3,173.1
Startup	-	1,511.0	-	-	1,511.0
Dismantlement	-	-	-	-	-
Total NFI	**1,451.9**	**40,507.2**	**250.0**	**250.0**	**42,459.1**
Allocated U&S Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Max	2008	2009	2010	2011	Total
Capital	-	-	-	-	-
Computer Hardware	-				
Computer Software	-	-	-	-	-
Land	-	-	-	-	-
Building	-	-	-	-	-
FEE and Capital Services	-	-	-	-	-
Startup	-	-	-	-	-
Dismantlement	-	-	-	-	-
Total NFI	-	-	-		-
Allocated Capital	-	-	-	-	-
NBV Write-off	-	-	-	-	-

Project Release Date	Info only	6/1/2008
Project Spending Begins	Info only	6/1/2008
Project Startup		12/31/2009
Project Benefits Begin	info only	12/31/2009

PROJECT BENEFITS:

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

Revenue Growth Projects

Volume/Yr - kg

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Volume	-	-	-	-	-	-	-	-	-	-	-	-	-
Product B Volume	-	-	-	-	-	-	-	-	-	-	-	-	-
Product C Volume (MWh)	-	-	52,867.500	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5	52,867.5
Product D Volume	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod A *Methyl Ester*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Notes 2, 5 Raw Materials	-	-	0.000089	0.000178	0.000267	0.000356	0.000445	0.000533	0.000622	0.000711	0.000800	0.000889	0.000889
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Note 3 Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001

Increm Cost/unit Prod B *Technical Glycerin*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod C *Power to PLN*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Increm Cost/unit Prod D -	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Raw Materials	-	-	-	-	-	-	-	-	-	-	-	-	-
Utilities	-	-	-	-	-	-	-	-	-	-	-	-	-
Conversion	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Incremental	-	-	-	-	-	-	-	-	-	-	-	-	-

Low Tier Selling Price/unit or Buy Price for Make vs. Buy Cases

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Product A Price (k$/kg)	0.00123	0.00129	0.00135	0.00141	0.00147	0.00154	0.00161	0.00169	0.00176	0.00184	0.00193	0.002017	0.00211
Product B Price (k$/kg)	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053
Product C Price (k$/MWh)	0.05833	0.06008	0.06189	0.06374	0.06565	0.06762	0.06965	0.07174	0.07389	0.07611	0.07840	0.08075	0.08317
Product D Price	-	-	-	-	-	-	-	-	-	-	-	-	-

Royalty Pmts % of NSR	0%
Note 4 Working Capital % of Revenue	9.29%

PRIME ENGINEERING INCORPORATED

Input form for "Standard Projects"

NOTE: DO NOT ADD OR DELETE ROWS OR COLUMNS ON THIS SHEET!

MAT: k$	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Note 4 Selling Expenses	-	-	98.2	101.1	104.1	107.3	110.5	113.8	117.2	120.7	124.3	128.1	131.9
Note 4 General & Admin Exp	-	-	752.5	775.1	798.3	822.3	846.9	872.4	898.5	925.5	953.2	981.8	1,011.3
Note 4 Other Expenses	-	-	130.9	134.8	138.8	143.0	147.3	151.7	156.3	161.0	165.8	170.8	175.9

KEY SENSITIVITIES:

Note 1: Incremental cost per unit for Product A includes costs for all Products A, B, and C.
Note 2: Raw materials costs based on Greenline Industries costs for methanol, methylate, ion resin recharge - CPO cost EXCLUDED = $89 per metric ton
Note 3: Conversion costs based on Indonesian labor, supervisory, maintenance, laboratory, and others at $17.85 per metric ton
Note 4: Costs estimated based on Annual Report Analysis

Growth Rate = 4.6% Annual growth of biodiesel sales price

CPO 2008 Price = 0 US$/MT (CPO Basis)
Note 5: CPO Price is added to Raw Materials Cost in year 2009 then linearly decreased to $800/MT to 2019

Annual G&A 23% of revenue

WACC = 16.4% Weighted Average Cost of Capital (investment hurdle rate)

PRIME ENGINEERING

EXHIBIT "A" - INCREMENTAL INCOME STATEMENT - K$

PT Perkebunan Nusantara III	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
REVENUE:																				
NET SALES REVENUE	0	0	3272	3370	3471	3575	3682	3793	3907	4024	4145	4269	4397	4397	4397	4397	4397	4397	4397	4397
PARTNER PAYMENT AMORT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LESS ROYALTY PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NET REVENUE	0	0	3272	3370	3471	3575	3682	3793	3907	4024	4145	4269	4397	4397	4397	4397	4397	4397	4397	4397
MANUFACTURING COST:																				
COGS (EXCL DEP.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL DEPRECIATION (SL)	0	7	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2474	29	29	29
PROJECT & START-UP EXP	952	3732	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INSURANCE & TAXES	0	363	365	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368	368
OTHER INCR. COST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DISMANTLING EXPENSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OBSOLESCENCE (WRITE OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL COGS	952	4102	2845	2848	2848	2848	2848	2848	2848	2848	2848	2848	2848	2848	2848	2848	2841	396	396	396
GROSS MARGIN	-952	-4102	426	522	623	727	834	945	1059	1176	1297	1421	1549	1549	1549	1549	1556	4001	4001	4001
GROSS MARGIN-%	0%	0%	13%	15%	18%	20%	23%	25%	27%	29%	31%	33%	35%	35%	35%	35%	35%	91%	91%	91%
SELLING	0	0	98	101	104	107	110	114	117	121	124	128	132	132	132	132	132	132	132	132
GENERAL & ADMINISTRATIVE	0	0	753	775	798	822	847	872	899	925	953	982	1011	1011	1011	1011	1011	1011	1011	1011
OTHER EXPENSES	0	0	131	135	139	143	147	152	156	161	166	171	176	176	176	176	176	176	176	176
TOTAL MAT	0	0	982	1011	1041	1073	1105	1138	1172	1207	1243	1281	1319	1319	1319	1319	1319	1319	1319	1319
OPERATING INCOME:	-952	-4102	-555	-489	-418	-345	-270	-193	-113	-31	53	140	230	230	230	230	237	2682	2682	2682
OTHER INCOME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-3121	-2797	-2439	-2043	-1606	-1123	-590	0	0	0	0	0	0	0	0	0	0	0
INCOME BEFORE TAXES	-952	-4102	2565	2308	2021	1698	1336	930	476	-31	53	140	230	230	230	230	237	2682	2682	2682
TAXES ACCRUED	-286	-1231	770	692	606	509	401	279	143	-9	16	42	69	69	69	69	71	804	804	804
NET INCOME:	-666	-2871	1796	1615	1414	1189	935	651	333	-22	37	98	161	161	161	161	166	1877	1877	1877

EXHIBIT "B" - INCREMENTAL CASH FLOW - K$

PRIME ENGINEERING

PT Perkebunan Nusantara III

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
INCOME BEF TAXES:	-952	-4102	2565	2308	2021	1698	1336	930	476	-31	53	140	230	230	230	230	237	2682	2682	2682
BOOK DEPRECIATION	0	7	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2480	2474	29	29	29
OBSOLESCENCE (WRITE-OFF)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INTEREST EXPENSE	0	0	-3121	-2797	-2439	-2043	-1606	-1123	-590	0	0	0	0	0	0	0	0	0	0	0
PRE-TAX CASH INCOME	-952	-4095	1925	1991	2062	2135	2210	2287	2367	2449	2533	2620	2710	2710	2710	2710	2710	2710	2710	2710
DEPRECIATION (FOR TAX):																				
BUILDING	0	0	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
MACHINERY & EQUIPMENT	0	7355	11768	7061	4236	4236	2118	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL TAX DEPRECIATION	0	7355	11794	7086	4262	4262	2144	26	26	26	26	26	26	26	26	26	26	26	26	26
TAXES PAID	-286	-3435	-2961	-1529	-660	-638	20	678	702	727	752	778	805	805	805	805	805	805	805	805
SUBTOTAL:	-666	-660	4886	3520	2722	2773	2190	1609	1665	1722	1781	1842	1905	1905	1905	1905	1905	1905	1905	1905
CAPITAL EXPENDITURES:																				
LAND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BUILDING	500	500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACHINERY & EQUIPMENT	0	36275	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PARTNER PAYMENTS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALLOCATED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CORPORATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPEND.	500	36775	250	250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNUAL WORKING CAPITAL	0	0	304	313	322	332	342	352	363	374	385	397	408	408	408	408	408	408	408	408
WORKING CAPITAL CHANGE	0	0	304	9	9	10	10	10	11	11	11	12	12	0	0	0	0	0	0	0
ANNUAL CASH FLOW OPERATIONS	-1166	-37435	4332	3261	2713	2763	2180	1599	1654	1711	1770	1830	1893	1905	1905	1905	1905	1905	1905	1905
WORKING CAPITAL RECOVERY												0								
PERPETUITY VALUE												1	0	0	0	0	0	0	0	0
TOTAL ANNNUAL CASH FLOW	-1166	-37435	4332	3261	2713	2763	2180	1599	1654	1711	1770	1831	1893	1905	1905	1905	1905	1905	1905	1905
CUMULATIVE CASH FLOW	-1166	-38601	-34270	-31009	-28296	-25533	-23353	-21754	-20100	-18389	-16620	-14788	-12895	-10990	-9086	-7181	-5276	-3371	-1466	438
DISCOUNT FACTORS	1.00	1.16	1.35	1.58	1.84	2.14	2.49	2.90	3.37	3.92	4.57	5.31	6.19	7.20	8.38	9.76	11.36	13.22	15.39	17.91
DISCOUNTED CASH FLOW	-1166	-32161	3197	2067	1478	1293	877	552	491	436	388	345	306	265	227	195	168	144	124	106
CUM DISC CASH FLOW	-1166	-33327	-30130	-28062	-26585	-25292	-24415	-23863	-23372	-22936	-22548	-22204	-21898	-21633	-21406	-21211	-21043	-20899	-20775	-20669
NET PRESENT VALUE	-22115																			
DISCOUNTED PAYBACK-YRS	0.0																			
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IRR-%	-9.1%																			

IRR and NPV Formulas must be reviewed to ensure that calculations are based on 10 years benefits after project startup

CASH FLOW AFTER DEBT SERVICE	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
TOTAL ANNUAL CASH FLOW	(1,166)	(37,435)	4,332	3,261	2,713	2,763	2,180	1,599	1,654	1,711	1,770	1,831	1,893	1,905	1,905	1,905	1,905	1,905	1,905	1,905
INTEREST PAYMENTS	0	0	(3,121)	(2,797)	(2,439)	(2,043)	(1,606)	(1,123)	(590)	0	0	0	0	0	0	0	0	0	0	0
CASH FROM COMBINED LOAN		29,721																		
TOTAL NET CASH FLOW	(1,166)	(7,714)	1,211	464	274	720	574	475	1,064	1,711	1,770	1,831	1,893	1,905	1,905	1,905	1,905	1,905	1,905	1,905
EFFECTIVE IRR-%	1.9%																			

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PT Perkebunan Nusantara III

PRIME ENGINEERING

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
(A) SENIOR DEBT LEAD ARRANGER																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ 29,721.37			29,721	26,636	23,227	19,460	15,298	10,699	5,616											
INTEREST PAYMENTS (US$ '000)				(3,121)	(2,797)	(2,439)	(2,043)	(1,606)	(1,123)	(590)											
PRINCIPAL REPAYMENT (US$ '000)				(3,085)	(3,409)	(3,767)	(4,162)	(4,599)	(5,082)	(5,616)											
CLOSING BALANCE (US$ '000)				26,636	23,227	19,460	15,298	10,699	5,616	-											
DEBT SERVICE PAYMENT (US$ '000)				(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)											
(B) SENIOR DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	9.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(C) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	10.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
(D) SUBORDINATED DEBT																					
LENDER NAME	Bank Name																				
ALL-IN RATE	11.50%																				
TENOR, YR	7																				
GRACE PERIOD FROM CLOSURE, YR	1																				
OPENING BALANCE (US$ '000)	$ -			-	-	-	-	-	-	-											
INTEREST PAYMENTS (US$ '000)				-	-	-	-	-	-	-											
PRINCIPAL REPAYMENT (US$ '000)				-	-	-	-	-	-	-											
CLOSING BALANCE (US$ '000)				-	-	-	-	-	-	-											
DEBT SERVICE PAYMENT (US$ '000)				-	-	-	-	-	-	-											
DEBT FACILITY COMBINED - ALL																					
OPENING BALANCE (US$ '000)		-	-	29,721	26,636	23,227	19,460	15,298	10,699	5,616	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(3,121)	(2,797)	(2,439)	(2,043)	(1,606)	(1,123)	(590)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(3,085)	(3,409)	(3,767)	(4,162)	(4,599)	(5,082)	(5,616)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	26,636	23,227	19,460	15,298	10,699	5,616	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	-	-	-	-	-	-	-	-	-	-	-
DEBT FACILITY COMBINED - SENIOR																					
OPENING BALANCE (US$ '000)		-	-	29,721	26,636	23,227	19,460	15,298	10,699	5,616	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)		-	-	(3,121)	(2,797)	(2,439)	(2,043)	(1,606)	(1,123)	(590)	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)		-	-	(3,085)	(3,409)	(3,767)	(4,162)	(4,599)	(5,082)	(5,616)	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)		-	-	26,636	23,227	19,460	15,298	10,699	5,616	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)		-	-	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	-	-	-	-	-	-	-	-	-	-	-

EXHIBIT "C" - DEBT SERVICE ANALYSIS

PRIME ENGINEERING

DEBT FACILITY COMBINED - SUB																				
OPENING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTEREST PAYMENTS (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PRINCIPAL REPAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLOSING BALANCE (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE PAYMENT (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEBT SERVICE COVERAGE																				
CASH AVAIL. FOR DEBT SERVICE (CADS)	(1,166)	(37,435)	4,332	3,261	2,713	2,763	2,180	1,599	1,654	1,711	1,770	1,831	1,893	1,905	1,905	1,905	1,905	1,905	1,905	1,905
DISCOUNT RATE, BLENDED	10.5%																			
PERIOD	-	-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
DISCOUNTED CADS	(1,166)	(37,435)	4,332	2,951	2,222	2,048	1,462	970	909	851	796	746	697	635	575	520	471	426	386	349
NPV CADS OVER LOAN LIFE			14,893																	
NPV CADS OVER PROJECT LIFE			21,344																	
DEBT SERVICE PAYMENTS:																				
TOTAL (US$ '000)	-	-	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	-	-	-	-	-	-	-	-	-	-	-
ALL SENIOR (US$ '000)	-	-	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	(6,206)	-	-	-	-	-	-	-	-	-	-	-
ALL SUBORDINATED (US$ '000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SENIOR DEBT CADS:																				
CASH FLOW AVAIL FOR SENIOR DEBT			SHORT	SHORT	SHORT	SHORT	SHORT	SHORT	SHORT											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SENIOR DEBT			-	-	-	-	-	-	-											
NPV CADS OVER LOAN LIFE			-																	
SUBORDINATED DEBT CADS:																				
CASH FLOW AVAIL FOR SUB DEBT			SHORT	SHORT	SHORT	SHORT	SHORT	SHORT	SHORT											
PERIOD			-	1	2	3	4	5	6											
DISCOUNTED CADS FOR SUB DEBT			-	-	-	-	-	-	-											
NPV CADS OVER LOAN LIFE			-																	
DEBT SERVICE COVERAGE RATIOS:																				
DSCR TARGET GUIDELINES: 1.15-1.35																				
DSCR - ALL			0.70	0.53	0.44	0.45	0.35	0.26	0.27											
DSCR - SENIOR			0.70	0.53	0.44	0.45	0.35	0.26	0.27											
DSCR - SUBORDINATED			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!											
LOAN LIFE COVER RATIOS:																				
LLCR - ALL			(0.07)																	
LLCR - SENIOR			(0.07)																	
LLCR - SUBORDINATED			#DIV/0!																	
PROJECT LIFE COVER RATIOS:																				
PLCR - ALL			0.65																	
DEBT TO EQUITY RATIO - D/E			2.33																	

LLCR TARGET GUIDELINES:	GOOD	BETTER
* Full Offtake, No Cross-Currency Risk:	1.20	1.30
* Partial Offtake, No Cross-Currency Risk:	1.50	2.00

APPENDIX C

CONCEPTUAL DRAWINGS

PT Perkebunan Nusantara III
(Persero)

PT PERKEBUNAN NUSANTARA III FEASIBILITY STUDY

BIODIESEL PROCESSING AND ENERGY PRODUCTION PLANT PROJECT

29 SEPTEMBER 2008

ENGINEER OF RECORD:
PRIME ENGINEERING, INC.
1888 EMERY ST NW
SUITE 300
ATLANTA, GA 30318

18/F ONE INTERNATIONAL FINANCE CENTRE
ONE HARBOUR VIEW STREET
CENTRAL
HONG KONG

CONTACT: MR. BRYAN WEBB
+1-404-425-7100

IN-COUNTRY ENGINEER:
PT TRACON INDUSTRI
REKAYASA OFFICE BUILDING 2, 3RD FLOOR
JL. KALIBATA TIMUR I NO. 36
JAKARTA -12740
INDONESIA

CONTACT: MR. JOHANNES S. KARIO
PHONE: +62 (21) 7974367

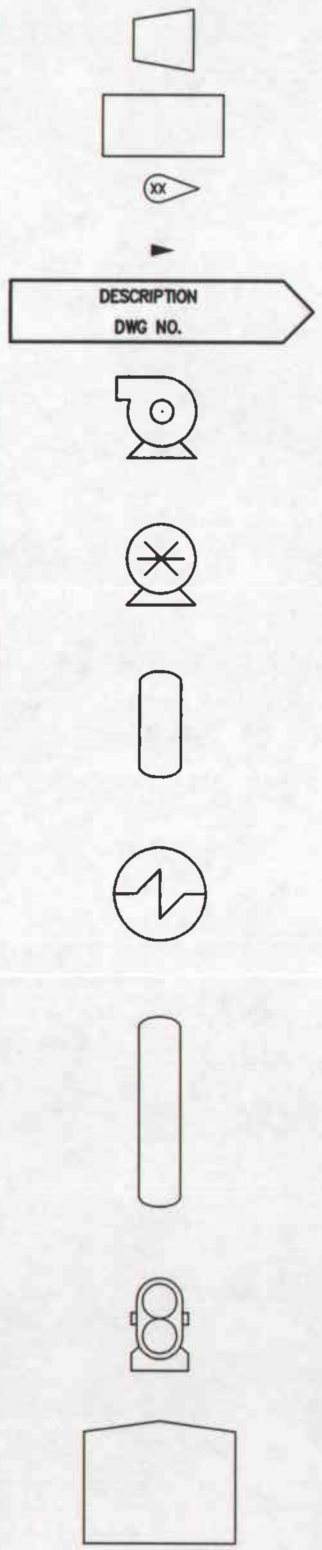
OWNER:
PT PERKEBUNAN NUSANTARA III
JI. SEI BATANGHARI NO. 2 MEDAN 20122
NORTH SUMATERA - INDONESIA

CONTACT: IR. AMRI SIREGAR
PHONE: +6261 8452244, 8453100

DRAWING LIST

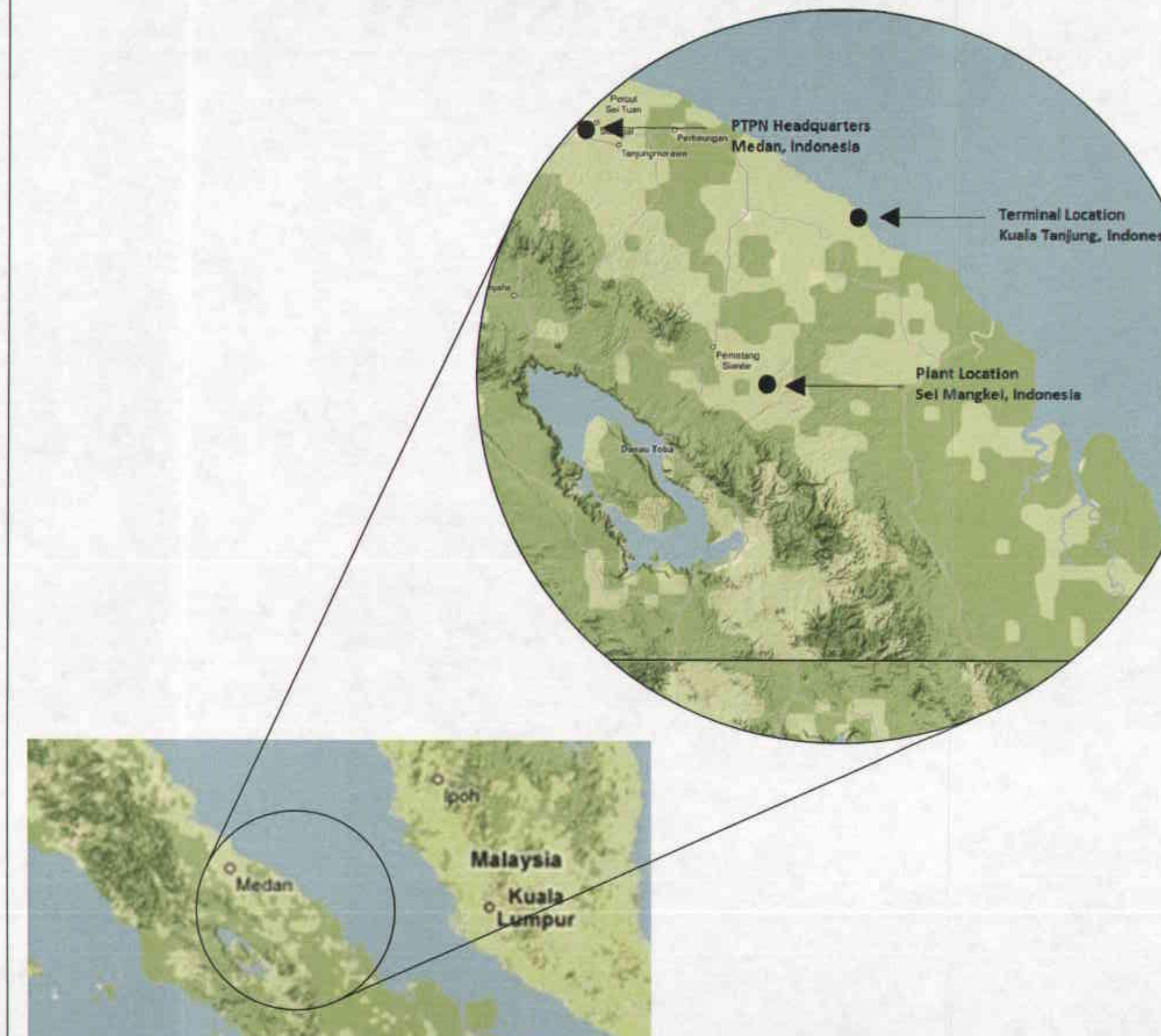
PRIME ENGINEERING INCORPORATED®
PROJECT NUMBER 1267-0001

PFD LEGEND



- TURBINE
- PROCESS DESCRIPTION BLOCK
- STREAM LABEL
- PROCESS FLOW ARROW
- DIRECTIONAL FLOW REFERENCE BLOCK (SHEET CONNECTOR)
- PUMP
- GEAR PUMP
- COLUMN
- HEATER, REBOILER OR CONDENSER
- DISTILLATION COLUMN
- VACUUM PUMP
- STORAGE TANK

LOCATION PLAN



ABBREVIATIONS

BFW	=	BOILER FEEDWATER
°C	=	DEGREES CELSIUS
CPO	=	CRUDE PALM OIL
CWR	=	COOLING WATER RETURN
CWS	=	COOLING WATER SUPPLY
EFB	=	EMPTY FRUIT BUNCH
FFA	=	FREE FATTY ACID
FFB	=	FRESH FRUIT BUNCH
HP	=	HIGH PRESSURE
ISBL	=	INSIDE BATTERY LIMIT
KG/H	=	KILOGRAMS PER HOUR
LP	=	LOW PRESSURE
ME	=	METHYLESTER
MT	=	METRIC TON (1,000 KG)
MW	=	MEGAWATT
O/H	=	OVERHEAD
OSBL	=	OUTSIDE BATTERY LIMIT
OST	=	ONSTREAM TIME
PFD	=	PROCESS FLOW DIAGRAM
RBD	=	REFINED, BLEACHED, DRIED

PRIME ENGINEERING
INCORPORATED
1888 EMERY STREET, N.W., SUITE 300
ATLANTA, GEORGIA 30318
404-425-7100

PROJECT:
BIODIESEL REFINERY & BIOMASS ENERGY PLANT FEASIBILITY STUDY
MEDAN, INDONESIA

PREPARED FOR:
PTPN III

REVISIONS

NO.	DATE	DESCRIPTION
A	13-MAY-08	CLIENT REVIEW
B	29-SEP-08	FINAL SUBMITTAL

SEAL

DATE:

DRAWING TITLE
LEGEND AND ABBREVIATIONS

DRAWING DATE	10-JUL-08
DRAWN BY	LMT
DRAWING SCALE	NONE
DESIGNED BY	TMM
PROJECT NUMBER	1267-0001
CHECKED BY	TMM
DRAWING NUMBER	G-000

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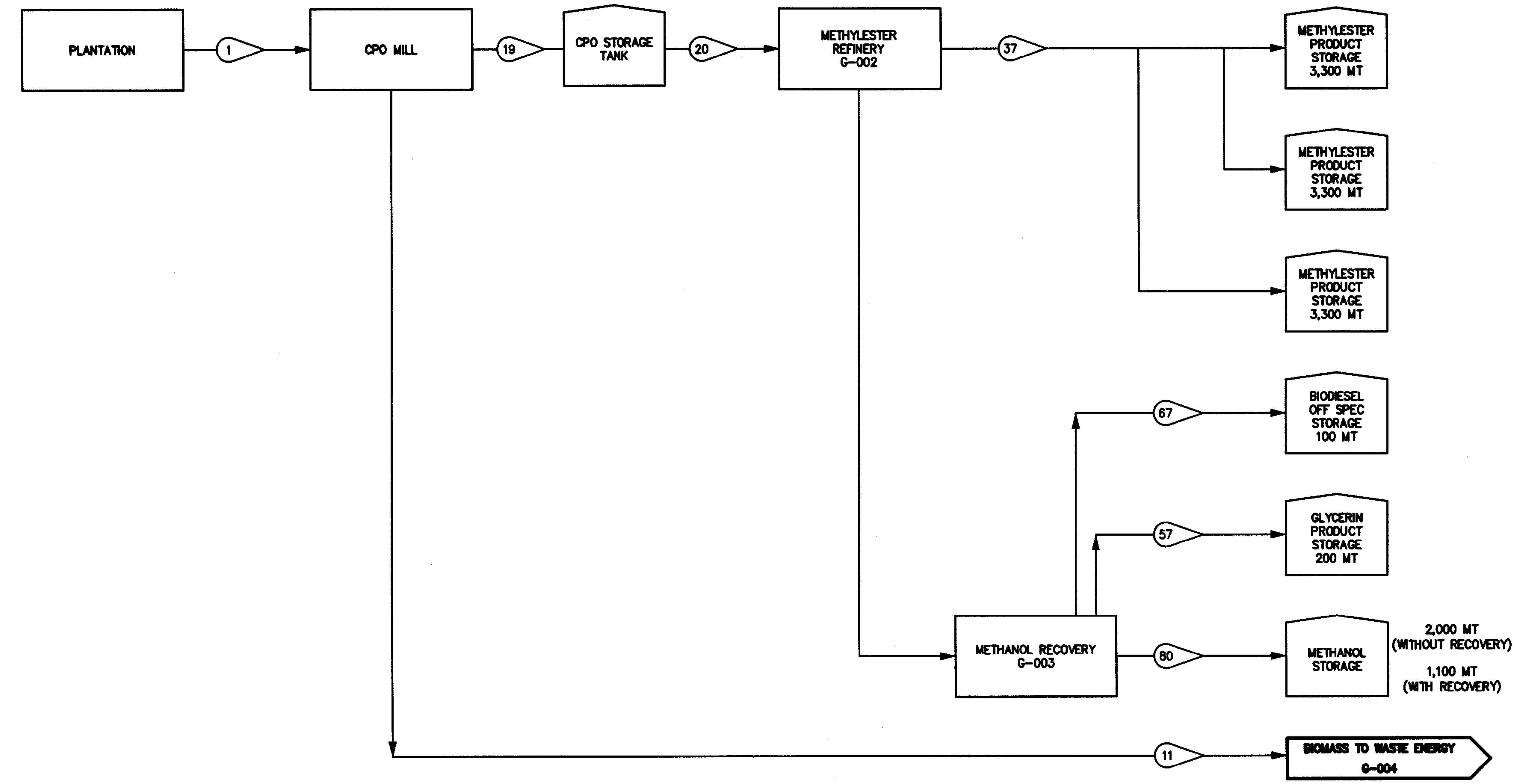

Stream ID		1	11	19	20	37	57	67	80
Component		FFB from Plantation	Biomass to Waste Energy	Wet CPO (RBD)	Wet CPO (RBD)	Finished Biodiesel	Crude Glycerin (85%)	Recovered Biodiesel	Recovered Methanol
Cellulosic Material	kg/h	55800	55800	0	0	0	0	0	0
Triglyceride	kg/h	15000	0	15041	15041	0	0	0	0
Free Fatty Acid, FFA	kg/h	750	0	752	752	0	0	0	0
Methylester	kg/h	0	0	0	0	15038	0	0	0
Methanol, CH3OH	kg/h	0	0	0	0	0	135	125	1361
Glycerin, C3H5(OH)3	kg/h	0	0	0	0	8	1557	0	0
Sodium Hydroxide, NaOH	kg/h	0	0	0	0	0	0	0	0
Sodium Methoxide, NaOCH3	kg/h	0	0	0	0	0	0	0	0
Hydrochloric Acid, HCl	kg/h	0	0	0	0	0	0	0	0
Sodium Chloride, NaCl	kg/h	0	0	0	0	0	110	0	0
Water, H2O	kg/h	750	0	752	752	36	0	0	trace
TOTAL	kg/h	72300	55800	16545	16545	15081	1802	125	1361
Temperature	°C	AMB	AMB	AMB	AMB	31	40	35	37

CAPACITY DESIGN BASIS
FFB TO CPO YIELD = 22%
CPO TO REFINED, BLEACH, DRIED (RBD) PALM OIL = 95%
RBD TO METHYLESTER YIELD = 99.5%
FFA CONTENT IN CPO = 5%
PLANT ONSTREAM TIME = 95%
OPERATING HOURS PER YEAR = 6,650

PRIME ENGINEERING

PROJECT: BIODIESEL REFINERY & BIOMASS ENERGY PLANT FEASIBILITY STUDY MEDAN, INDONESIA

PREPARED FOR: PTPN III

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A	13-MAY-08	CLIENT REVIEW

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DATE:

DRAWING TITLE
PFD-PLANT SUMMARY 100,000 MT/Y

DRAWING DATE 10-JUL-08	DRAWN BY MAG
DRAWING SCALE NONE	DESIGNED BY TMM
PROJECT NUMBER 1267-0001	CHECKED BY MAG
DRAWING NUMBER G-001	

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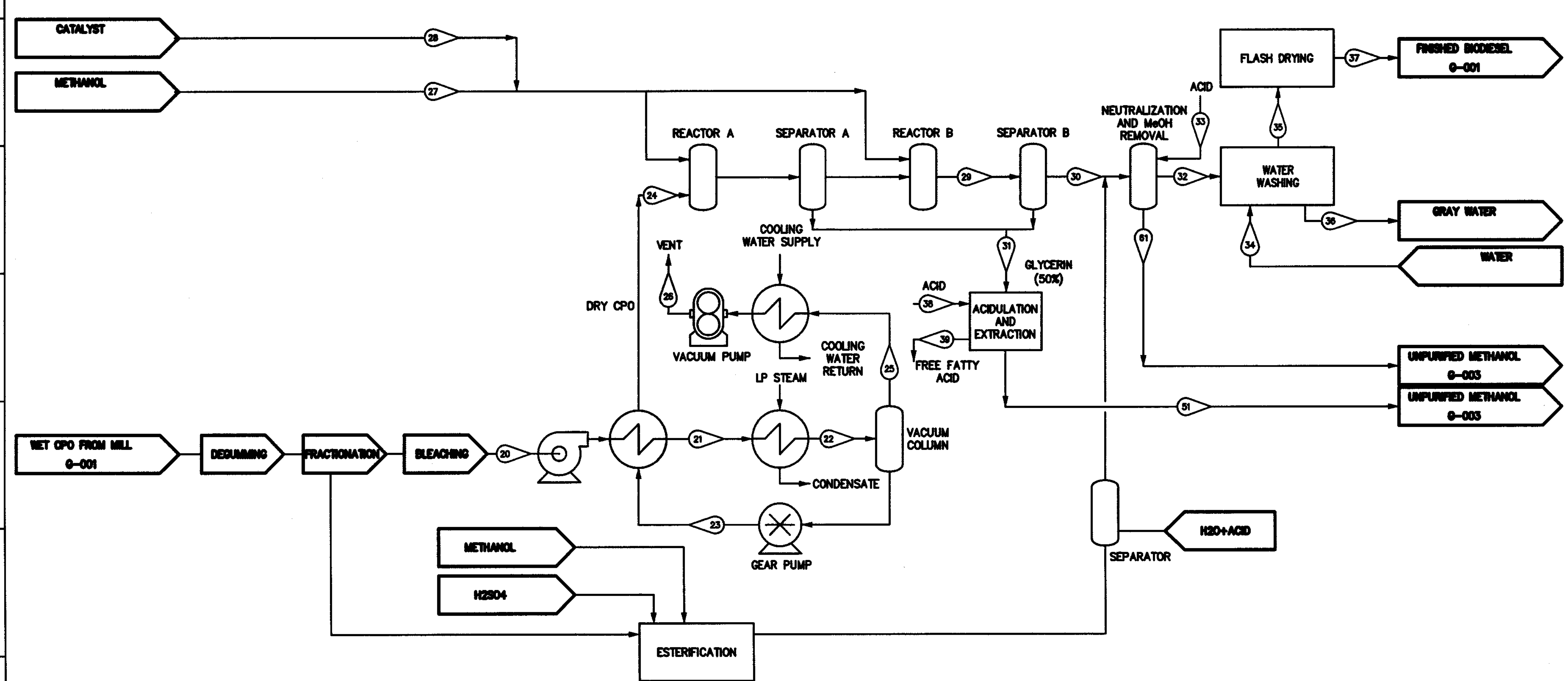


Stream ID		20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	51	61
Component		Wet CPO from Mill	Wet CPO	Wet CPO	Dry CPO	Dry CPO	Moisture	Moisture	Methanol	Catalyst	Reactor Products	Methyl Esters	Crude Glycerin (50%)	Crude Methylester	Acid	Water	Wet Methylester	Grey Water	Finished Biodiesel	Acid	Free Fatty Acid	Unpurified Methanol	Unpurified Methanol
Fresh Fruit Bunch, FFB	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Empty Fruit Bunch, EFB	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Triglyceride	kg/h	15041	15041	15041	15041	15041	0	0	0	0	75	75	0	75	0	0	0	75	0	0	0	0	0
Free Fatty Acid, FFA	kg/h	752	752	752	752	752	0	0	0	0	752	0	752	0	0	0	0	0	0	0	752	0	0
Methylester	kg/h	0	0	0	0	0	0	0	0	0	15038	15038	0	15038	0	0	15038	0	15038	0	0	0	0
Methanol, CH3OH	kg/h	0	0	0	0	0	0	0	3265	0	1573	786	786	0	0	0	0	0	0	0	0	846	786
Glycerin, C3H5(OH)3	kg/h	0	0	0	0	0	0	0	0	0	1564	0	1557	8	0	0	8	0	8	0	0	1557	0
Sodium Hydroxide, NaOH	kg/h	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium Methoxide, NaOCH3	kg/h	0	0	0	0	0	0	0	0	0	102	0	102	0	0	0	0	0	0	0	0	0	0
Hydrochloric Acid, HCl	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	0	0	0
Sodium Chloride, NaCl	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	110	0
Water, H2O	kg/h	752	752	752	15	15	737	737	0	0	34	17	17	0	0	18797	940	17857	36	69	0	17	17
TOTAL	kg/h	16545	16545	16545	15808	15808	737	737	3265	75	19137	15916	3214	15120	0	18797	15985	17932	15081	137	752	2530	803
Temperature	°C	25	45	80	80	40	80	35	25	25	37	37	37	37	25	25	31	31	31	25	37	37	37

PRIME ENGINEERING

PROJECT: BIODIESEL REFINERY & BIOMASS ENERGY PLANT FEASIBILITY STUDY MEDAN, INDONESIA

PREPARED FOR: PTPN III

REVISIONS		
NO.	DATE	DESCRIPTION
A	13-MAY-08	CLIENT REVIEW

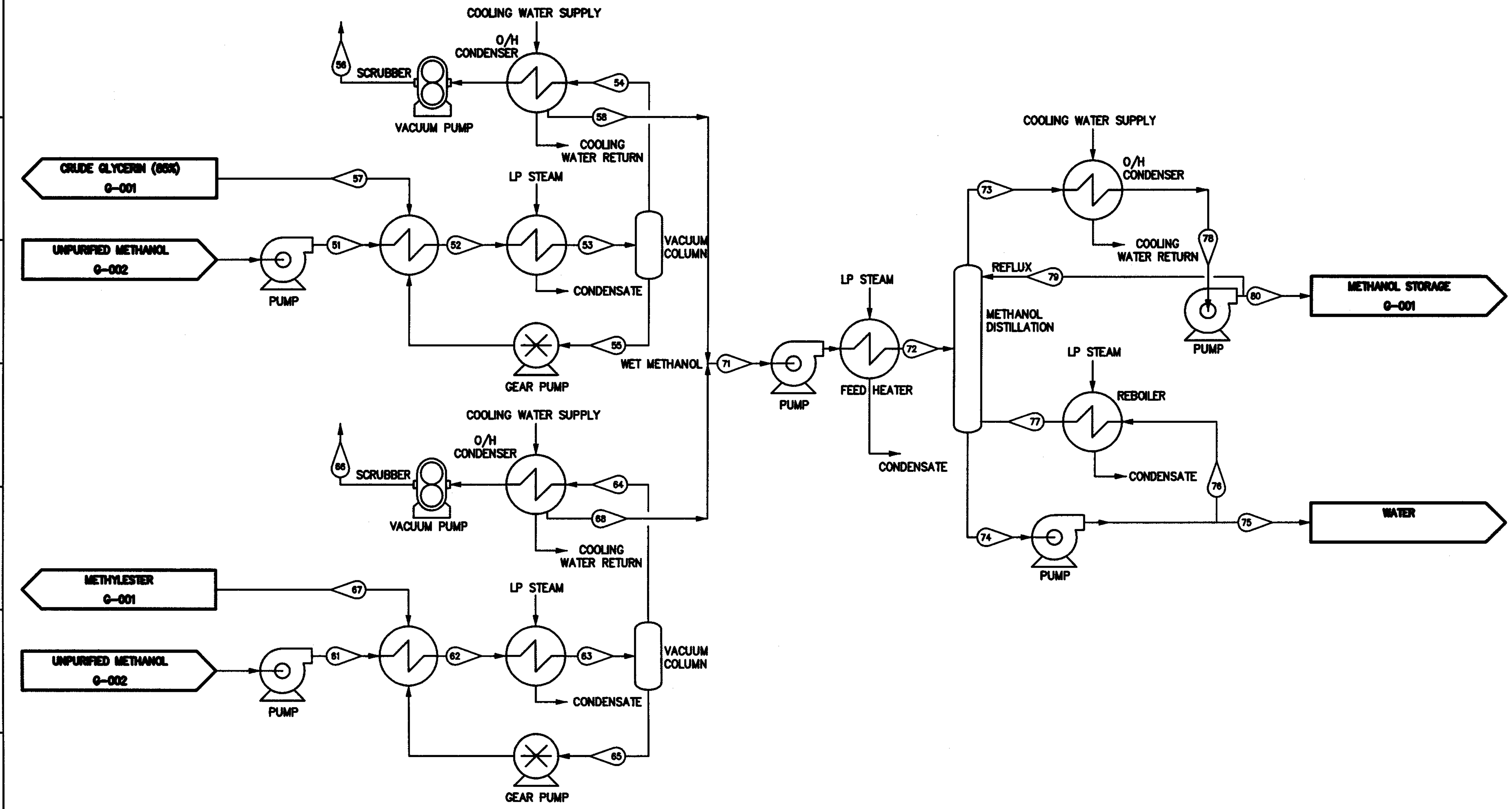
SEAL

DATE:

DRAWING TITLE

PFD METHYLESTER REFINING 100,000 MT/Y

DRAWING DATE 10-JUL-08	DRAWN BY JRF
DRAWING SCALE NONE	DESIGNED BY MAG
PROJECT NUMBER [illegible]	CHECKED BY TMM
DRAWING NUMBER G-002	



Stream ID		51	52	53	54	55	56	57	58	61	62	63	64
Component		Unpurified Methanol	Unpurified Methanol	Unpurified Methanol	Overhead Methanol	Crude Glycerin	Vent to Scrubber	Crude Glycerin	Wet Methanol	Unpurified Methanol	Unpurified Methanol	Unpurified Methanol	Overhead Methanol
Fresh Fruit Bunch, FFB	kg/h	0	0	0	0	0	0	0	0	0	0	0	0
Empty Fruit Bunch, EFB	kg/h	0	0	0	0	0	0	0	0	0	0	0	0
Triglyceride	kg/h	0	0	0	0	0	0	0	0	0	0	0	0
Free Fatty Acid, FFA	kg/h	0	0	0	0	0	0	0	0	0	0	0	0
Methylester	kg/h	0	0	0	0	0	0	0	0	0	0	0	0
Methanol, CH3OH	kg/h	846	846	846	711	135	4	135	708	786	786	786	661
Glycerin, C3H5(OH)3	kg/h	1557	1557	1557	0	1557	0	1557	0	0	0	0	0
Sodium Hydroxide, NaOH	kg/h	0	0	0	0	0	0	0	0	0	0	0	0
Sodium Methoxide, NaOCH3	kg/h	0	0	0	0	0	0	0	0	0	0	0	0
Hydrochloric Acid, HCl	kg/h	0	0	0	0	0	0	0	0	0	0	0	0
Sodium Chloride, NaCl	kg/h	110	110	110	0	110	0	110	0	0	0	0	0
Water, H2O	kg/h	17	17	17	17	0	0	0	17	17	17	17	17
TOTAL	kg/h	2530	2530	2530	728	1802	4	1802	725	803	803	803	678
Temperature	°C	37	50	75	75	75	35	40	35	37	50	75	75

Stream ID		65	66	67	68	71	72	73	74	75	76	77	78	79	80
Component		Offspec Bottoms	Vent to Scrubber	To Offspec Methylester	Wet Methanol	Wet Methanol	Wet Methanol	Overhead Methanol	Bottoms Water	Water to Storage	Reboiler	Reboiler	Condensed Methanol	Reflux	Methanol to Storage
Fresh Fruit Bunch, FFB	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Empty Fruit Bunch, EFB	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Triglyceride	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Free Fatty Acid, FFA	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methylester	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Methanol, CH3OH	kg/h	125	3	125	658	1365	1365	6807	20	4	16	16	6807	5445	1361
Glycerin, C3H5(OH)3	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium Hydroxide, NaOH	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium Methoxide, NaOCH3	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrochloric Acid, HCl	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium Chloride, NaCl	kg/h	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water, H2O	kg/h	0	0	0	17	34	34	1	168	34	134	134	1	0	0
TOTAL	kg/h	125	3	125	674	1399	1399	6807	188	38	151	151	6807	5446	1361
Temperature	°C	75	35	40	35	35	85	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

PRIME ENGINEERING

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PROJECT:
BIODIESEL REFINERY & BIOMASS ENERGY PLANT FEASIBILITY STUDY
MEDAN, INDONESIA

PREPARED FOR:
PTPN III

REVISIONS		
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A	13-MAY-08	CLIENT REVIEW

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DATE:

DRAWING TITLE

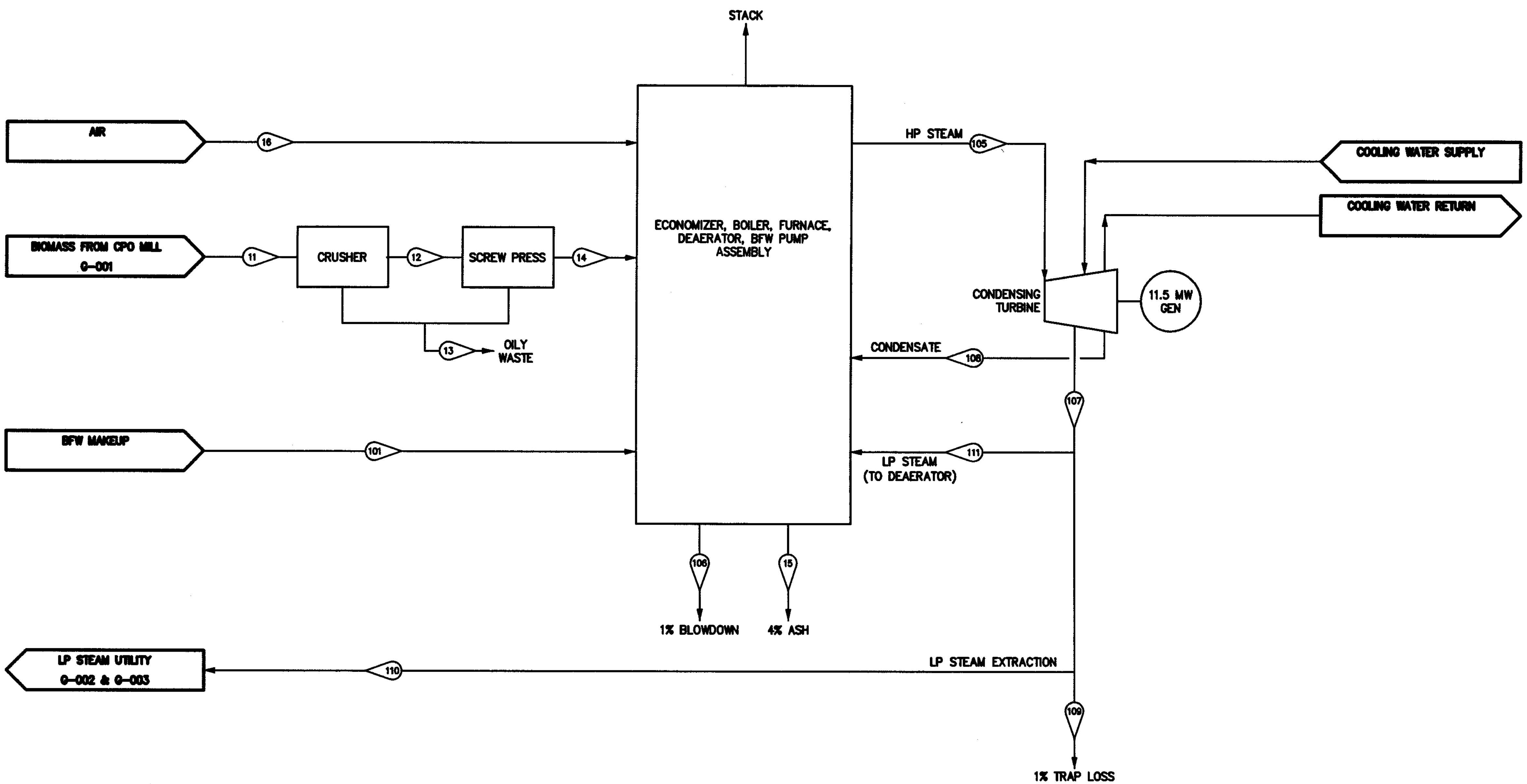
PFD - METHANOL RECOVERY 100,000 MT/Y

DRAWING DATE	DRAWN BY
10-JUL-08	MAG
DRAWING SCALE	DESIGNED BY
NONE	MAG
PROJECT NUMBER	CHECKED BY
1267-0001	TMM

DRAWING NUMBER

G-003

[redacted]



Stream ID		11	12	13	14	15	16	101	105	106	107	108	109	110	111
Component		Biomass to Crusher	Biomass to Screw Press	Oily Waste	Biomass to Feed Furnace	EFB Ash	Air top EFB Furnace	BFW Makeup to Deaerator	HP Steam	Boiler Blowdown	LP Steam Extraction	Condensate to Deaerator	Condensate Trap Loss	LP Steam to Users	LP Steam to Deaerators
Flowrate	kg/h	55800	54126	10875	44925	1797	By Vendor	By Vendor	91666	917	By Vendor	By Vendor	By Vendor	33500	By Vendor
Temperature	oC	AMB	AMB	AMB	AMB	AMB	AMB	10	220	220	139	100	100	139	139
Pressure	barg	ATM	ATM	ATM	ATM	ATM	ATM	By Vendor	20	20	2.5	0.1	0.1	2.5	2.5

PRIME
ENGINEERING
[redacted]

PROJECT:
BIODIESEL REFINERY & BIOMASS ENERGY PLANT FEASIBILITY STUDY
MEDAN, INDONESIA

PREPARED FOR:
PTPN III

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DRAWING TITLE
PFD-ENERGY PRODUCTION 100,000 MT/Y

DRAWING DATE 10-JUL-08	DRAWN BY LMB
DRAWING SCALE NONE	DESIGNED BY MAG
PROJECT NUMBER 1267-0001	CHECKED BY TMM

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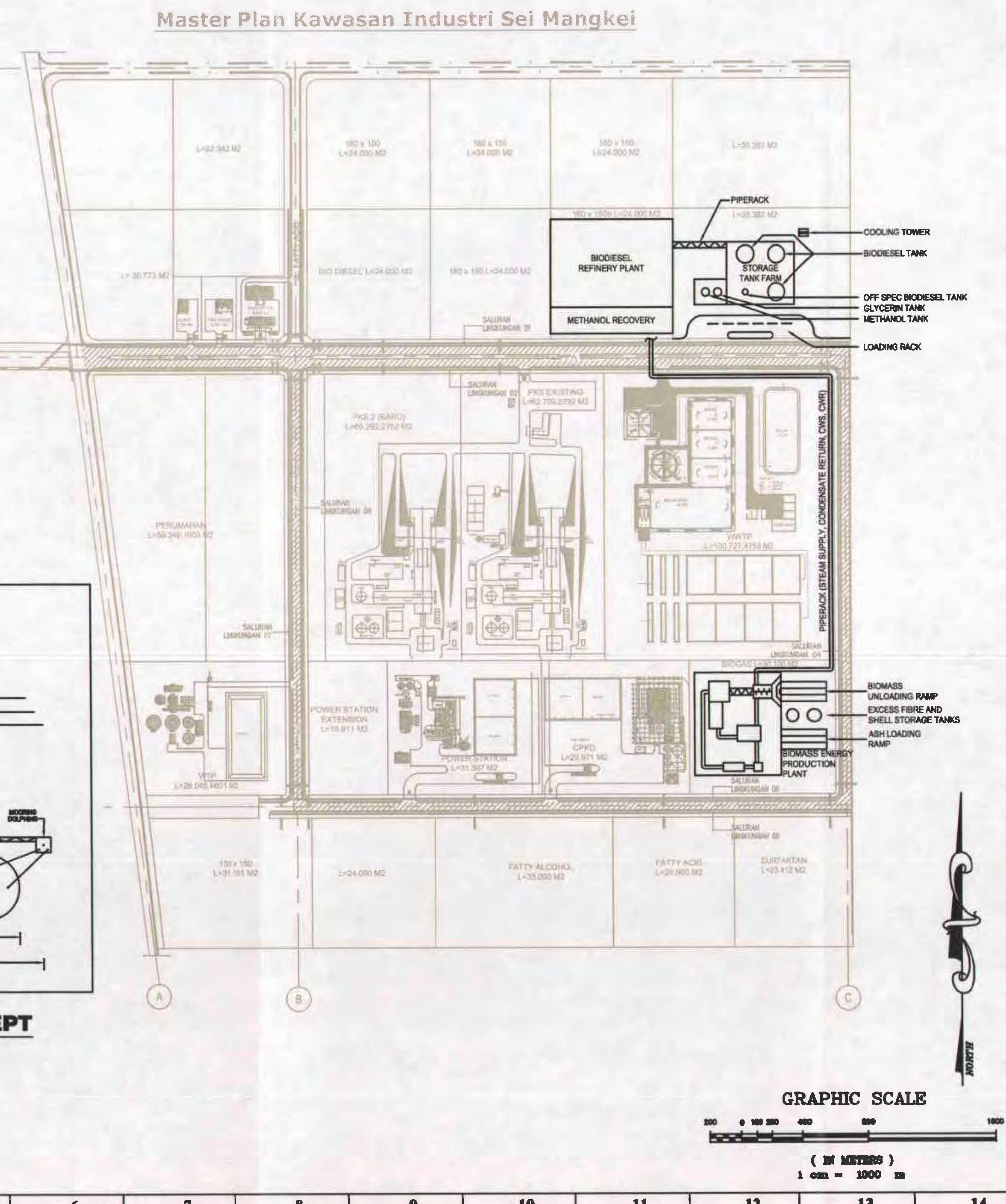
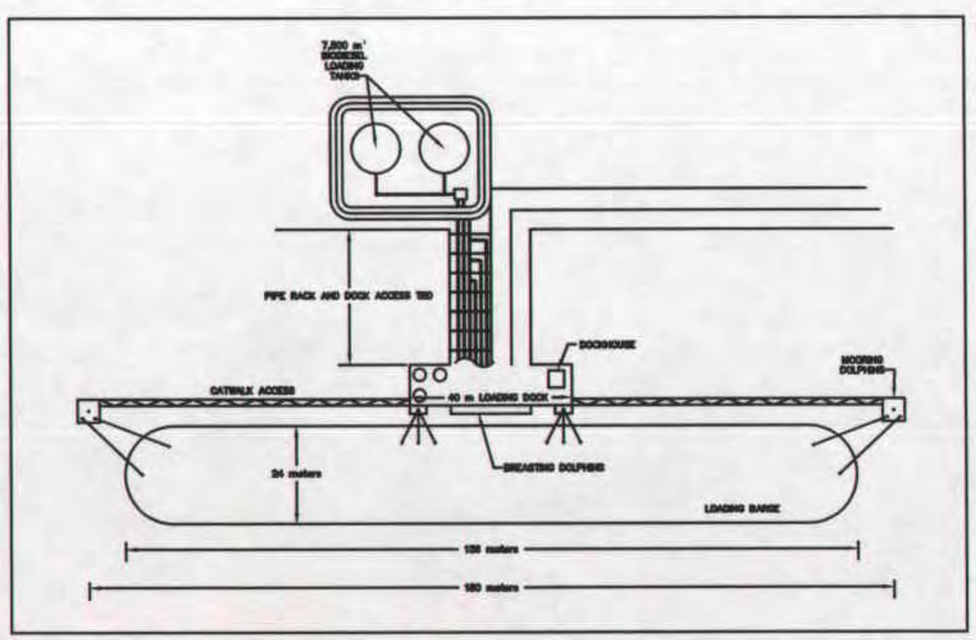
G-004





1 G-006 KUALA TANJUNG TERMINAL CONCEPT
SCALE: NTS

PRIME ENGINEERING

PROJECT: BIODIESEL REFINERY & BIOMASS ENERGY PLANT FEASIBILITY STUDY MEDAN, INDONESIA

PREPARED FOR: PTPN III

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CONCEPTUAL SITE PLAN

DRAWING DATE 10-JUL-08	DRAWN BY LMB
DRAWING SCALE NONE	DESIGNED BY MAG
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DRAWING NUMBER G-006	

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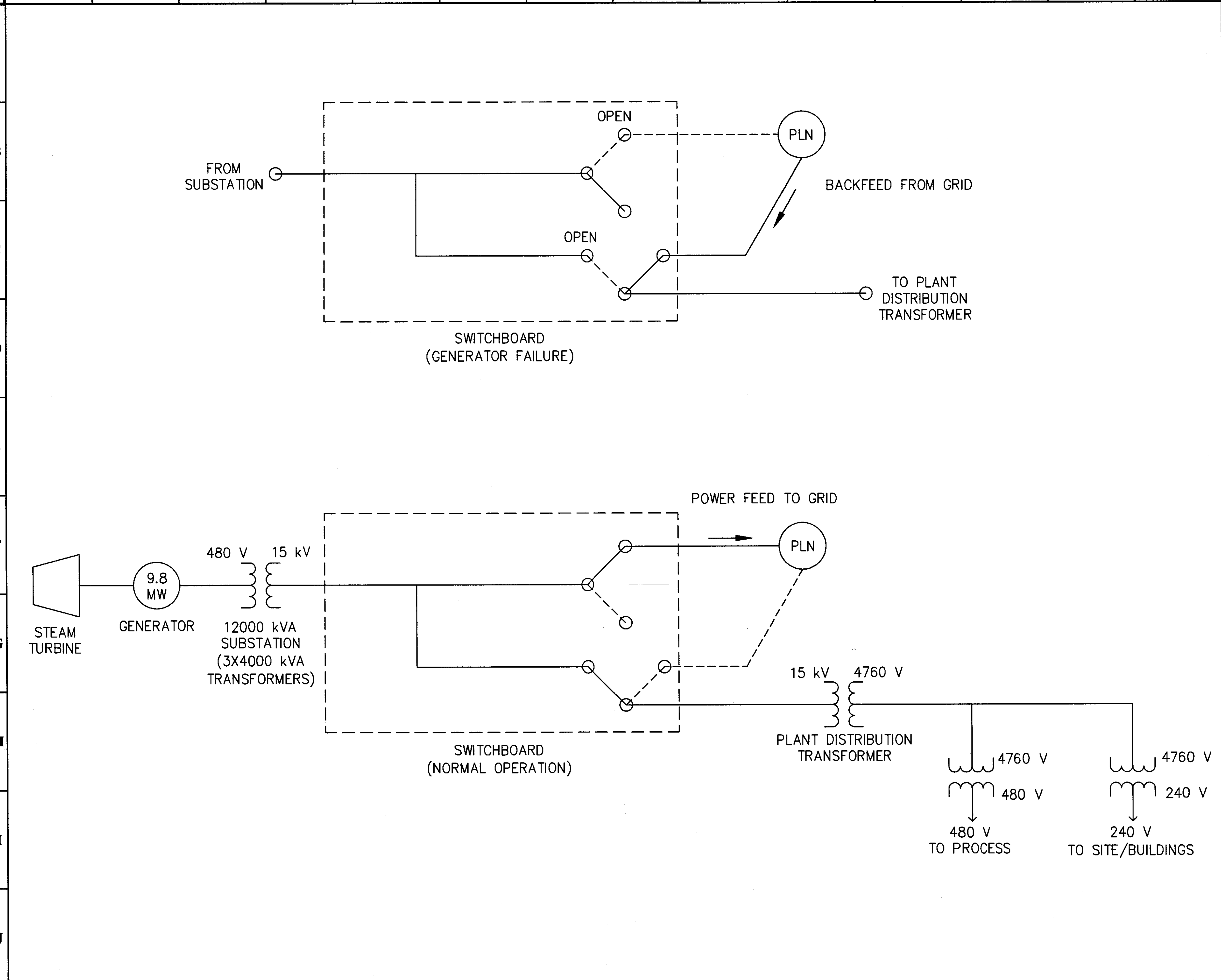

PRIME ENGINEERING

INCORPORATED

PROJECT: BIODIESEL REFINERY & BIOMASS ENERGY PLANT FEASIBILITY STUDY

PREPARED FOR: PTPN III

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ELECTRICAL ONE-LINE CONCEPT

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DRAWING NUMBER E-001	

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