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Environmental and Social Impact Due Diligence Report (28 November 2016)

Issuer	KNM Group Berhad
Relevant Business Activities ("RBA")	Cassava Bioethanol Production
Countries of Operations	Thailand
ESMS Category	Category B for Environment Category C for Involuntary Resettlement and Indigenous People

A. Executive Summary

1. The institutional capacity and commitment of KNM

   KNM Group Berhad ("the Company", "KNM" or "the Group" with its subsidiary) is a leading global manufacturer of process equipment and processing units for the downstream oil and gas, petrochemicals, minerals processing, desalination, renewable energy, chemicals, and power industries. It specializes in the design, manufacture, fabrication, assembly, commissioning and maintenance of process equipment including membrane technology systems, fired and heat recovery boilers, process gas waste heat recovery systems, compression systems, pressure vessels, heat exchangers, skid mounted packages and modules, and related products such as process pipe systems, storage tanks, specialized structural assemblies and module assemblies. The Group's major customers are international O&G, petrochemicals, energy and minerals processing companies and global engineering contractors amongst whom many are Fortune 500 companies i.e. Toyo Engineering Group, CNOOC Oil, Technip E&C Inc. etc.

   The Group is transforming to a renewable energy producer based on its fabrication and operation and maintenance (O&M) experiences for renewable projects. It has invested in two renewable energy projects, one in Thailand and the other in UK. The Thai project is expected to generate some recurring incomes for the Group from 2H 2016 while the UK project will be operational from 2018.

   KNM's capacity and commitment to manage the Thai bio-ethanol project's environmental and social impacts are deemed adequate. It has adopted the internationally recognized environmental and safety management system guidelines such as ISO 14001:2004 (Environmental Management System) and OHSAS 18001:2007 (Occupation Health and Safety Assessment Series). The bond's proceeds will be used to (i) repay the debt facilities of the existing Thai ethanol project, (ii) invest for future expansion and (iii) fund working capital of the plant.

2. Thai Ethanol Project Details
   2.1. Project Company: Impress Ethanol Co., Ltd ("IEL")
   2.2. Project location: The project is located at Moo 13, Khao Hin Sorn Subdistrict, Panom Sarakham District, Chachoengsao Province, approximately 120 kilometers from Bangkok. The project area is approximately 500 rais (800,000 square meters);
   2.3. Main product: Ethanol (C_2H_5OH), 99.8% minimum purity, to be mixed with gasoline in different proportions to make different fuel products; for example E10, E20, E85;
   200,000 liters (158 tons) ethanol production per day with 1 month (6 million liters equivalent to 4,734 tons) ethanol storage tanks. With future expansion the capacity will be up to 400,000 liters (316 tons) ethanol production per day with 1 month (12 million liters equivalent to 9,468 tons) ethanol storage tanks.
   2.4. By product: Fusel oil, can be used as base for several products; for example, fragrance.
   2.5. Main feedstock: 500 tons of Cassava chips per day equal to 165,000 tons per year (330 days operations per year). 30% will be provided by the Company managed farming within a radius of 10 to 30km of the plant and 70% will be provided by cassava chip suppliers within 60km of the plant.

3. Assessment of Environmental Impact

Environmental Safety Assessment ("ESA") for IEL project has been approved by Thailand government authorities (Department of Industrial Work) during the application of factory operation permit. The factory operation permit was issued to IEL since May 2007. The ESA findings are shown in table below with overall very low environmental impact.

Parameters	Construction Phase	Operation Phase
1. Physical Resources		
• Landscape	Low	Low
• Air quality	Low	Low
• Noise level	Low	Low
• Soil	Medium	Low
• Surface water and its quality	Low	Low
• Underground water and its quality	Low	Low
2. Biological Resources		
• Terrestrial biological resources	Low	Low
• Aquatic biological resources	Low	Low
3. Utilization		
• Land utilization	Low	Low
• Transportation	Low	Low
• Water usage	Low	Low
• Electricity usage	Low	Low
• Waste management	Low	Low
• Drainage and flood protection	Low	Low

Parameters	Construction Phase	Operation Phase
4. Quality of Life		
• Impact on economic-social	Low	Low
• Impact on hygiene and safety	Low	Low
• Impact on aesthetics and tourism	Low	Low

Remark: Impact on soil during construction phase is from soil excavation and compaction which will result in loss of nutrient soil surface. However, since the activities take place only within project site boundary, the impact is considered medium.

4. Assessment of Social Impact

The Thai ethanol project is operated in an industrial zone. The land was owned by two local farmers and according to the Company, the land was purchased by the initial project company at fair value. The chairman of the local administration organization (Aor Bor Tor) also confirmed that there has been no issue with the local farmers around the area. No indigenous people is reported in the Thai ethanol project operated in the industrial zone. No involuntary resettlement impact is observed in the area.

5. Conclusion

The existing plant and its expansion have limited environmental and social impacts. Therefore, the project is categorized as "Category B" for Environment and "Category C" for Involuntary Resettlement and Indigenous People under the Project Bond ESI Framework of the Safeguard Standards.

B. Policy, Legal, and Administrative Framework

The Thai environmental laws governing the ethanol project are:

- Announcement No.2 (B.E.2539) by Department of Industrial Works, Factory Act (B.E.2535): Regulated Characteristics of Wastewater Released from Factories;
- Announcement by Department of Industrial Works: Variation of Characteristics of Wastewater from those stated in Announcement No.2 (B.E.2539) by Department of Industrial Works, Factory Act (B.E.2535): Regulated Characteristics of Wastewater Released from Factories;
- Announcement by Department of Industrial Works: Regulated Parameters of Impurities in Exhaust Gas from Factories, B.E.2549;
- Announcement by Department of Industrial Works: Regulated Noise and Sound Level from Factory Operations, B.E.2548.

The permits required for the construction and operation are issued as follows:

Permits	Issued by
Factory Operation Permit	Department of Industrial Works (DIW) / Provincial Industrial Office (PIO)
Ethanol Plant Permit	Excise Department
BOI Privilege Promotion	Board Of Investment (BOI)

Permits	Issued by
Excavation and Earth Filling Permit	Local Authority (Aor Bor Tor)
Groundwater Usage Permit	Department of Groundwater Resources
Groundwater Well Drilling Permit for underground water well #2	Department of Groundwater Resources
Groundwater Well Drilling Permit for underground water well #3	Department of Groundwater Resources
Construction Permit	Local Authority (Aor Bor Tor)

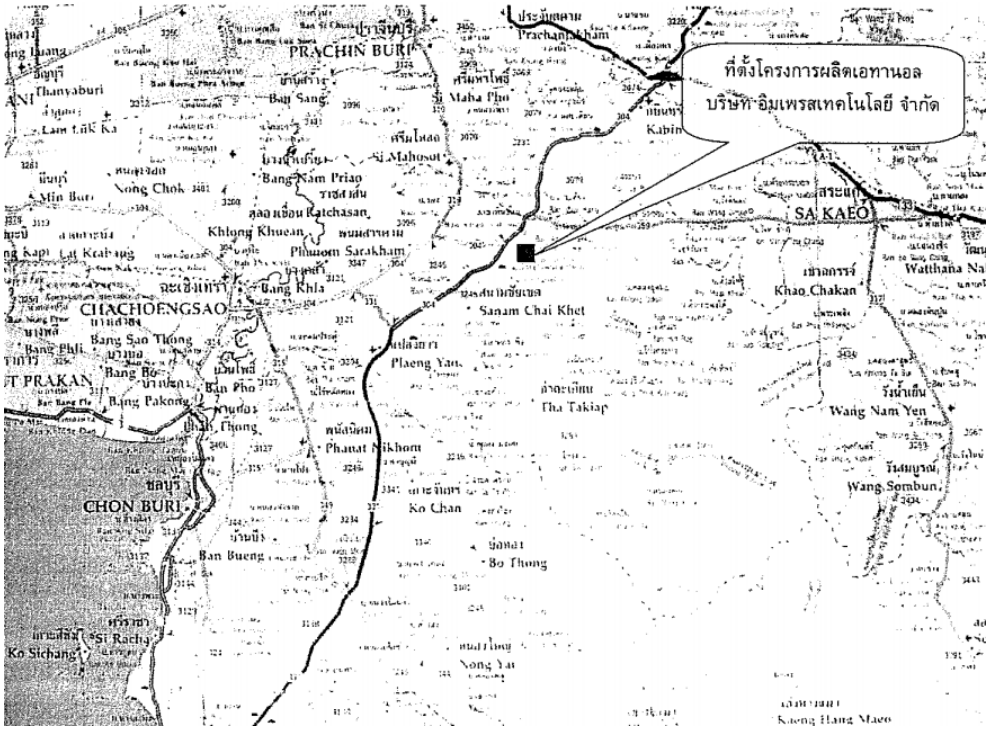
C. Description of the Project

The project of 200,000 liters per day ethanol plant at Moo 13, Khao Hin Sorn Subdistrict, Panom Sarakham District, Chachoengsao Province, approximately 120 kilometers from Bangkok. The project area is approximately 500 rais (800,000 square meters).

Major components of the project consist of:

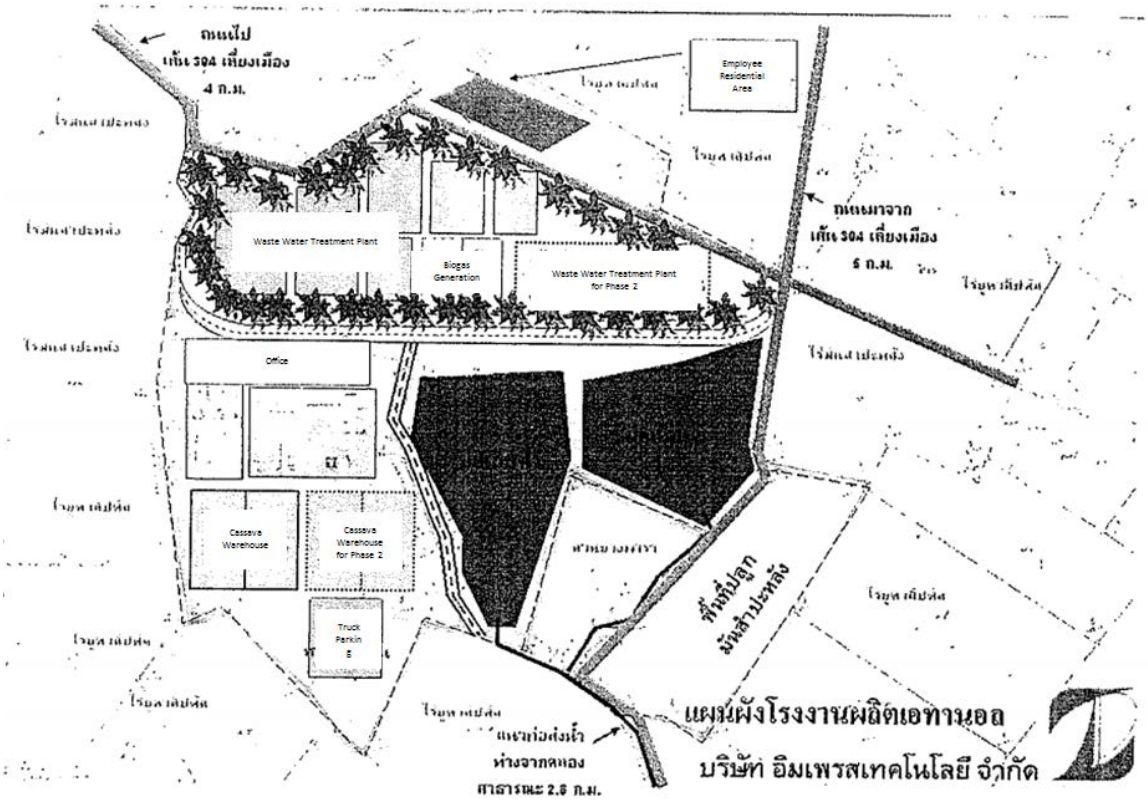
- Ethanol production process plant;
- Ethanol storage;
- Cassava storage yard (later becomes cassava chip warehouse);
- Cassava drying yard;
- Truck parking (for trucks delivering cassava chips);
- Raw materials warehouse;
- Wastewater treatment plant;
- Utilities building;
- Raw water reservoir;
- Office building;
- Laboratory;
- Roads;
- Employee accommodations.

The Project Location



Moo 13, Khao Hin Sorn Subdistrict, Panom Sarakham District, Chachoengsao Province

Site Layout



Utilities in construction phase:

1. Water: Estimated daily water consumption is 13.5 cubic meters. Contractors will supply water by themselves. In addition, there will be a reservoir in the project site;
2. Drainage: Temporary drainage will be used. Drained water will flow into reservoir in the project site;
3. Electricity: Electricity will be transmitted from Provincial Electricity Authority ("PEA") via temporary transformer provided by PEA.

Utilities in operation phase:

1. Water: Estimated daily water consumption is 2,000 cubic meters (process + service water). Supply of water will be from raw water reservoir with maximum capacity of 1,000,000 cubic meters;
2. Drainage & flood protection: Separate concrete drainage will be used to allow flow of rain water into raw water reservoir;
3. Electricity: 2 units of 500 kVA transformers will be used. In addition, 1 unit of spare electricity generator powered by diesel engine will be installed.

Cassava supply:

The Project will procure about 70% of its feedstock needs from the established cassava chip merchants under annual contracts that lock in supply but are linked to prevailing market prices. This allows IEL to fully utilize the established and low cost cassava chip supply market. IEL will produce up to 30% of feedstock needs through IFL, a cassava plantation business affiliated to IEL which will initially operate a farm of approximately 10,000 rai (1,600Ha) and agreements with local farmers (company managed farming) surrounding the IEL Ethanol Plant (within a radius of 10km to 30km)

D. Description of the Environment (Baseline Data)

The project area was agricultural areas in which cassava and eucalyptus were planted. Surroundings of the project boundaries are:

North: Eucalyptus planting areas;

East: Public road and Eucalyptus planting areas;

South: Eucalyptus and para wood planting areas;

West: Eucalyptus and cassava planting areas.

In a radius of 10 kilometers from the project site, 70% of the area in the radius comprise of cassava plantation areas. The project is located near refinery, fuel storage and seaport infrastructure.

Baseline study which covers a radius of 5 kilometers from the project site (in Chachoengsao Province mainly) can be categorized into 4 aspects:

1. Physical Resources

Soil: Most areas in Chachoengsao are lowland, with small hills in some areas. Soil in most areas is nutrient, suitable for plantation.
Water: Main sources of water for the study areas are Rabom canal, Si Yat canal and Ta Lad canal. The water source of the project is from Rabom canal. According to statistics, the canal can supply water of 68 million cubic meters annually, maximum supply of 18.26 million cubic meters is in September and minimum supply of 0.14 million cubic meters is in March.
Weather: Tropical weather. Summer is during May to October and winter is during November to February.

2. Biological Resources
Forest: Forest area of Chachoengsao is approximately 22% of total area or approximately 724,000 rais (1.2 million square meters). According to the study, there is no reserved forest in the study area.
Wild lives: The study areas are mainly areas developed for agriculture which are not suitable for wild lives. Furthermore, according to the study, there is not any significant breeding of aquatic animals in the study area.

3. Utilization
Land utilization in Chachoengsao can be presented in the following table:

Use	Area (Square kilometers)	%
Agricultural areas	65.30	82.78
Residential areas	7.45	9.44
Industrial areas	4.12	5.23
Water storage and canal	1.10	1.40
Uninhabited areas	0.91	1.15
Total	78.88	100.00

4. Quality of Life

Chachoengsao consists of 8 districts, 85 villages with a population of 76,889 persons. Main occupation was on agricultural activities, growing rice, para wood, mango, vegetables, soy bean and cassava. There were 102 registered industrial businesses in the province.

Data for this study was collected from:

- Thai Meteorological Department;
- Land Development Department
- Department of Mineral Resources;
- Royal Irrigation Department;
- Panom Sarakam District Administration Office;
- Provincial Electricity Authority, Panom Sarakam;
- Khao Hinsorn Health Station;
- Khao Hinsorn Subdistrict Administration Organisation;
- Panom Sarakam Municipal Administration.

E. Anticipated Environmental Impacts and Mitigation Measures

Summary of assessment of environmental impact can be presented in the following table:

Parameters	Construction Phase	Operation Phase
1. Physical Resources		
• Landscape	Low	Low
• Air quality	Low	Low
• Noise level	Low	Low
• Soil	Medium	Low
• Surface water and its quality	Low	Low
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2. Biological Resources		
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• Drainage and flood protection	Low	Low
4. Quality of Life		
• Impact on economic-social	Low	Low
• Impact on hygiene and safety	Low	Low
• Impact on aesthetics and tourism	Low	Low

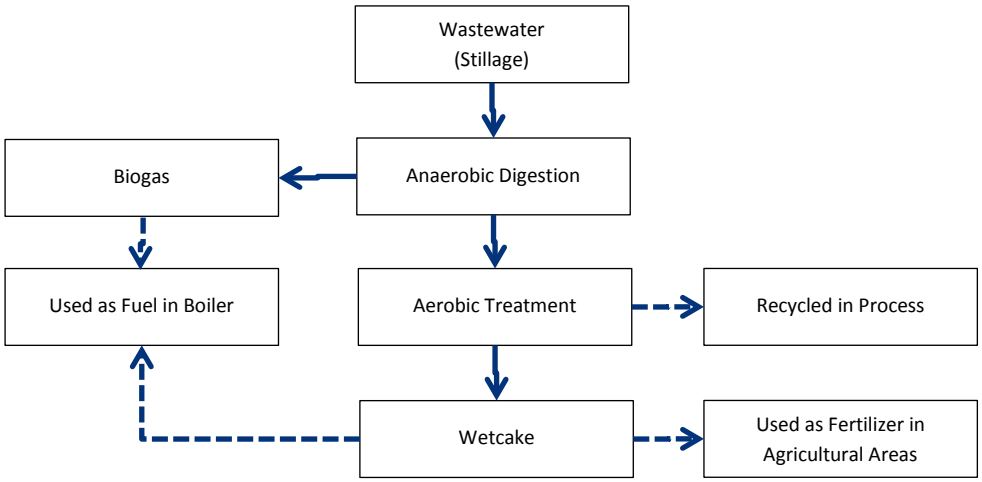
Remark: Impact on soil during construction phase is from soil excavation and compaction which will result in loss of nutrient soil surface. However, since the activities take place only in project site boundary, the impact is considered medium.

There are four sources of pollutions from the project which can be causes of environmental impacts:

1. Wastewater from ethanol production process;
2. Wastewater from offices and residential areas;
3. Air and noise pollution;
4. Wet cake.

Mitigation Measures:

1. Wastewater from ethanol production process.
   Wastewater of approximately 2,000 cubic meters per day will be treated in wastewater treatment plant. The process of wastewater treatment plant can be illustrated below:



Wastewater will be treated until its quality is in line with regulated parameters. The treated wastewater will be recycled into ethanol production process or distributed to agricultural areas upon request.

2. Wastewater from offices and residential areas will be treated in septic tanks;
3. Air and noise pollution: the air and noise protection line will be implemented around the project site for example, dust protection net and plantation of tall trees;
4. Wet cake can be dried to be used as fuel in biomass boiler or distributed to farmer as soil conditioner.

F. Analysis of Alternatives

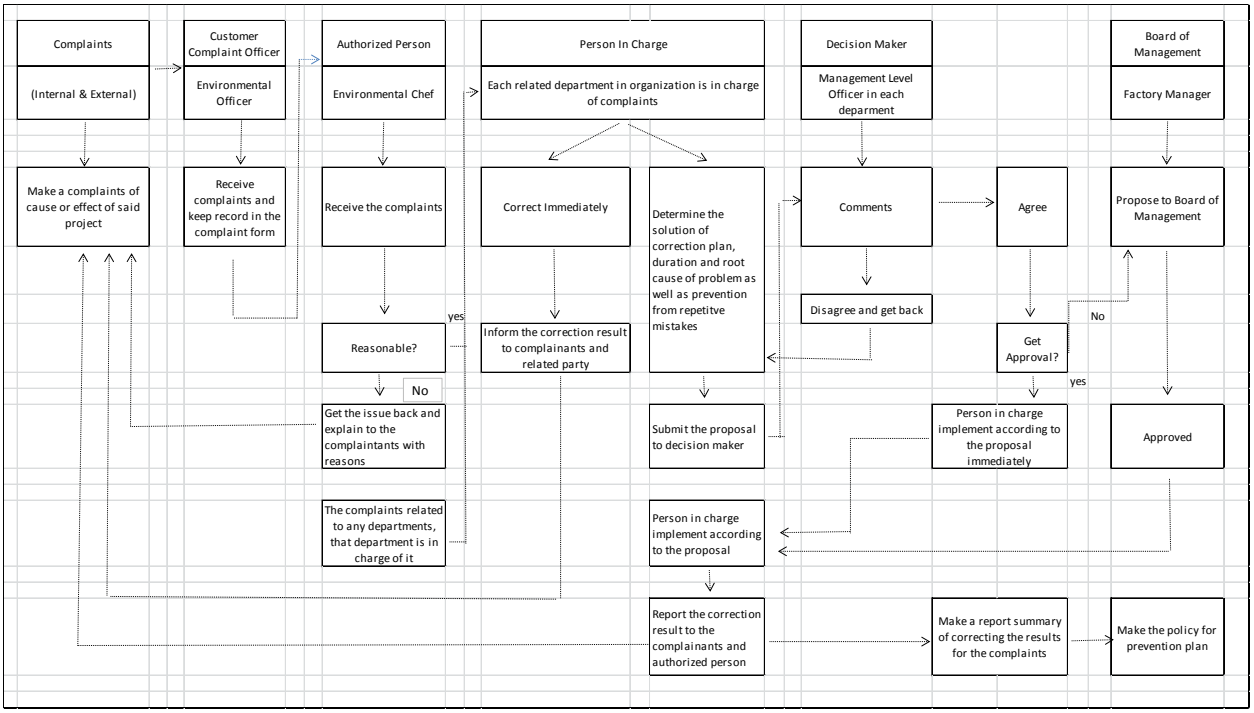
The plant is situated in the industrial zone "304 Industrial Park" surrounded by cassava plantations. The land was purchased by the initial project company at fair value and the project is anticipated by local people including the chairman of local authority. The environmental and social impacts are considered limited therefore it can be said that finding alternatives is not necessary.

G. Information Disclosure, Consultation, and Participation

Quarterly Safety Report will be prepared by Safety Officer at site and will be submitted to the Labor Office. The plant is already built with necessary permits and according to the Company and the chairman of local authority, there is no issue or claim from local people regarding the construction and operation of the plant.

H. Grievance Redress Mechanism

The flow chart below illustrates the mechanisms for resolving complaints about environmental performance:



I. Environmental Management Plan

(i) Mitigation:

The plant's construction is completed with around 2% of remaining works i.e. pipelining and mechanical testing before commercial production. As described in "E. Anticipated Environmental Impacts and Mitigation Measures" above, there is no anticipated significant adverse environmental impacts and risks from this project.

(ii) Monitoring:

Monitoring will be done to comply with required rules and safety regulations. Monitoring for the future expansion including procurement of machinery and building two additional ethanol storage tanks should be monitored.

(iii) Implementation arrangements:

The plant's construction is completed with around 2% of remaining works i.e. pipelining and mechanical testing before commercial production.

Safety Officer at site is responsible for carrying out the monitoring measures who prepares Internal HSE Statistic weekly report and submit Safety report to Labor Office every quarter.

No significant costs are expected since the Company has already the certificates of ISO 14001 (Environmental Management System) and OHSAS 18001(Occupation Health and Safety Assessment Series).

Also, the Thailand project is an existing ethanol plant and the future expansion is already taken into account when this construction is made. Therefore, there is no significant additional costs for environmental regulation compliance.

J. Conclusion and Recommendation

The existing plant and its expansion have limited environmental and social impacts. Therefore, the project is categorized as "Category B" for Environment and "Category C" for Involuntary Resettlement and Indigenous People under the Project Bond ESI Framework of the Safeguard Standards.

The institutional capacity and commitment of KNM to manage the project's environmental and social impacts are deemed adequate. It has adopted the internationally recognized environmental and safety management system guidelines such as ISO 14001:2004 (Environmental Management System) and OHSAS 18001:2007 (Occupation Health and Safety Assessment Series). The Thai ethanol plant of IEL was built with expected future expansion including procurement of machinery and two new ethanol storage tanks, with total capacity of 6 million liters or 4,734 tons, next to the existing tanks within the project area. Therefore, it will neither construct new plant nor acquire additional land. The expansion will finance procurement of machinery and equipment needed in the plant operations.