PROJECT ADMINISTRATION MANUAL

EMBEDDED POWER GENERATION

10 MWh Integrated Gasification Combined Cycle (IGCC) Power Plant for XENERGI LTD/XENERGI CONSORTIUM in Enpower Free Trade Zone, 9th Mile Corner, Enugu, Enugu State, Nigeria

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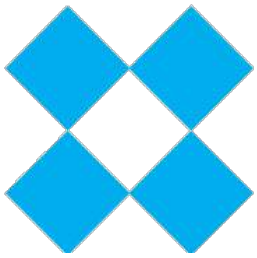
PROJECT ADMINISTRATION MANUAL
PAM

ENPOWER'S EMBEDDED POWER GENERATION PROJECT

10 MWh Integrated Gasification Combined Cycle
9th Mile Corner, Enugu State, Nigeria

by
MDA CAPITAL INVEST, a.s
MDACI CONSORTIUM
(Developer)

for
XENERGI LIMITED
XENERGI CONSORTIUM
(Project Owner)



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THE PROJECT ADMINISTRATION MANUAL

This Project Administration Manual (PAM) is designed to provide the *key Guidelines* (legal, technical and financial requirements, regulations, codes, standards, specifications, etc.) for the implementation (development, engineering, procurement, construction (EPC), and operation management) of the XENERGI's 10 MWh IGCC power plant for the Enpower Free Trade Zone located in 9th Mile Corner, Enugu, Enugu State, Nigeria.

The functions of this PAM are:

- to advise on the necessary steps to be taken to make the Projects achieve viability and effectiveness for bankability and financeability that are directly involved in the project from development, construction to operations management.

- to establish the working relationship between all the project entities:
  - the Developer – MDACI/MDACI CONSORTIUM;
  - the Project Owner – XENERGI LIMITED / XENERGI CONSORTIUM;
  - the Financier – EXIMBANKA SR / CEB, A.S.;
  - the Export Credit Guarantor and Insurance Corporation – EGAP, A.S.;
  - the Receiving bank – GUARANTY TRUST BANK PLC / ACCESS BANK PLC;
  - the EPC Contractor – ISTROENERGY INTERNATIONAL, A.S. (IEI);
  - the Fuel Supplier – N/A;
  - the Electricity Regulator – NERC; and
  - the Operations Management Company – MDACI CONSORTIUM.

- to explain in detail requirements for consultancy, engineering, procurement, construction and/or installation of goods and related services, and works;

- to conduct disbursement; and to ensure that the Project Entities understand their roles during development and construction phases;

- to justify the market and industry analysis and the viability of the Project;

- to develop the milestone outline and match development/pre-operational cost against the job outline; and

- to explain the reporting requirements for the project; and agree on a reporting format, allocation of responsibility and funding in line with the project design and monitoring framework that captures the key inputs, outputs and objectives required for the **Projects Performance Report** (PPR), and a reporting schedule.

NOTE
The information contained in this PAM are weekly updated with new information and changes in accordance with the implementation requirements of the Projects.

CHAPTER I: PROJECTS NATURE AND PURPOSE

1.1 INTRODUCTION

1.1.1 IMPLEMENTATION LOCATION OF THE PROJECT

The 10 MWh IGCC power project shall be implemented in the Enpower Free Trade Zone (EFTZ), which is located in **Enugu State**, a mainland state in south-eastern Nigeria. EFTZ is also known as Enugu Free Trade Zone, being the only existing free trade zone in the state. Its capital is **Enugu**, from which the state, created in 1991 from the old Anambra State, derives its name. The principal cities in the state are Enugu, Agbani, Awgu, Udi, Oji-River, and Nsukka. Enugu's 2021 population is now estimated at 795,271, which the population of Nigeria is 212,389,018 (the largest population in Africa).

1.1.1.1 Geography

Enugu State is one of the states in the eastern part of Nigeria. The state shares borders with Abia State and Imo State to the south, Ebonyi State to the east, Benue State to the northeast, Kogi State to the northwest and Anambra State to the west.

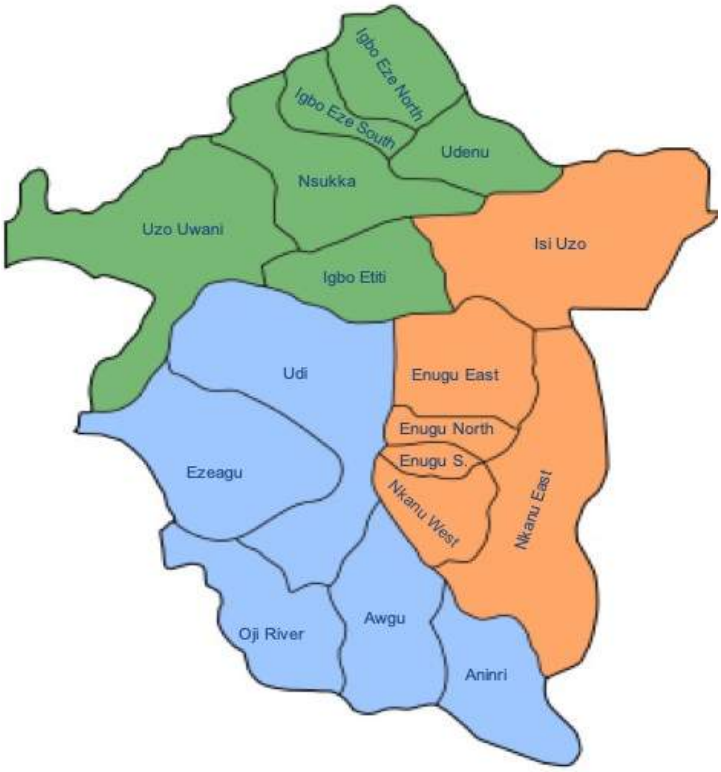

Fig. 1.1 – Map of Enugu State showing the 17 Local Government Areas (LGAs).

Enugu, the capital city of Enugu State, is approximately 2½ driving hours away from Port Harcourt, where coal shipments exited Nigeria. Enugu is also located within an hour's drive from Onitsha, one of the biggest commercial cities in Africa and 2 hours drive from Aba, another very large commercial city, both of which are trading centres in Nigeria. The

average temperature in this city is cooler to mild (60°F) in its cooler months and gets warmer to hot in its warmer months (upper 80°F) and very good for outdoor activities with family and friends or just for personal leisure.

Enugu has good soil-land and climatic conditions all year round, sitting at about 223 metres (732 ft) above sea level, and the soil is well drained during its rainy seasons. The mean temperature in Enugu State in the hottest month of February is about 87.16 °F (30.64 °C), while the lowest temperatures occur in the month of November, reaching 60.54 °F (15.86 °C). The lowest rainfall of about 0.16 cubic centimetres (0.0098 cu in) is normal in February, while the highest is about 35.7 cubic centimetres (2.18 cu in) in July.

1.1.1.2 History

The name of State derives from its capital city, Enugu. The word "Enugu" (from *Enu Ugwu*) means "the top of the hill". The first European settlers arrived in the area in 1909, led by a British mining engineer, Albert Kitson. In his quest for silver, he discovered coal in the Udi Ridge. Colonial Governor of Nigeria Frederick Lugard took keen interest in the discovery, and by 1914 the first shipment of coal was made to Britain. As mining activities increased in the area, a permanent cosmopolitan settlement emerged, supported by a railway system. Enugu acquired township status in 1917 and became strategic to British interests. Foreign businesses began to move into Enugu, the most notable of which were John Holt, Kingsway Stores, British Bank of West Africa and United Africa Company. From Enugu the British administration was able to spread its influence over the Southern Province of Nigeria. The colonial past of Enugu is today evidenced by the Georgian building types and meandering narrow roads within the residential area originally reserved for the whites, an area which is today called the Government Reserved Area (GRA).

From being the capital of the Southern Provinces, Enugu became the capital of the Eastern Region (now divided into nine States), the capital of now defunct Federal Republic of Biafra, thereafter, the capital of East Central State, Anambra State, (old) Enugu State, and now the capital of the present Enugu State through a process of state creation and diffusion of administrative authority.

1.1.1.3 Politics

The State Government and the Local Government are the two levels of government in Enugu State and in all other states of Nigeria. Sullivan Chime is the current executive governor for the whole of Enugu State. He was elected by the people of Enugu State in April 2007[1] and was sworn into office on May 29, 2007.[2] The governor is above a group of commissioners who he has placed as heads of ministries that oversee various portfolios such as Health and Housing; both the governor and the commissioners form the Executive Council of Enugu State. Government House, Enugu is where the government of the state is based.

[1] *The Daily Sun* (Sun News) December 14, 2007
[2] Daily Independent. May 4, 2010. Retrieved 2010-09-03

The 17 Local Government Areas in Enugu State[3]: Aninri, Awgu, Enugu East, Enugu North, Enugu South, Ezeagu, Igbo Etiti, Igbo Eze North, Igbo Eze South, Isi Uzo, Nkanu East, Nkanu West, Nsukka, Oji River, Udenu, Udi, and Uzo Uwani.

1.1.1.4 Economy

Economically, the state is predominantly rural and agrarian, with a substantial proportion of its working population engaged in farming, although trading (18.8%) and services (12.9%) are also important. In the urban areas trading is the dominant occupation, followed by services. A small proportion of the population is also engaged in manufacturing activities, with the most pronounced among them located in Enugu, Oji, Ohebedim and Nsukka. The state boasts of a number of markets especially at each of the divisional headquarters, prominent of which is the Ogbete Main market in the State capital, Enugu. There is also one of the largest grains market East of the Niger, the Orie Orba Market which plays host to most farmers from the North Central States of Benue, Kogi, Nassarawa and Plateau who use the market to dispose their produce for consumers in South-East and South-Southern Nigeria. Every four days, grains and other farm produce are found in large quantities and at highly competitive prices.

Energy

Electricity supply is relatively stable in Enugu and its Environs. The Oji River Power Station (which used to supply electricity to all of Eastern Nigeria) is located in Enugu State. With the deregulation of electricity generation in Nigeria, and the privatisation of the Power Holding Company of Nigeria (PHCN), it is hoped the State Government would assist private investors to negotiate the take over and reactivation of the Oji Power Station. **This is more so with the proximity of the Enugu coal mines to the power station, a driving distance of about 20 minutes**. There are also traces of crude oil in Ugwuoba, in the same Oji-River Local Government area of the state. The state will also negotiate with investors interested in investing in the coal mining in Enugu. The coal industry used to be one of the biggest employer of labour in the state and the state is looking to attract investors in the industry.

Education

Every community in Enugu State has at least one Primary/Elementary school and one Secondary school, funded and run by the State Government. There are also large numbers of private nursery, primary and secondary schools in Enugu State. Nigeria's first indigenous university, (University of Nigeria, Nsukka (UNN)), is located in Enugu State. The state also hosts the Enugu State University of Science & Technology (ESUT), Institute of Management and Technology (IMT), Federal Cooperative College, Oji River (FCCO), Enugu State College of Education Technical, Enugu, Caritas University, Amorji-Nike, Renaissance University, Ugbawka; Federal Government College Enugu, Federal School of Dental Technology & Therapy College of Immaculate Conception, Enugu; Queen’s School Enugu a Prominent high school for girls in the Eastern region; St. Theresa's College, Nsukka; Special Science Boys' Secondary School Agbani, Nkanu West l.g.a; [St. Patrick's Secondary School], Emene; Bigard Memorial Seminary, Enugu; Awgu County College, Nenwe; Community Secondary School, Ugbo-Okpala, Ugbo;

[3] Nigerian National Bureau of Statistics (NNBS)

Corpus Christi College, Achi, [Royal Crown Academy, Nsukka, Enugu State, Enugu]; Our Saviour Institute of Science and Technology, Enugu; and the Federal College of Education, Eha-Amufu, Seat of Wisdom Secondary School Trans Ekulu Enugu. There are also a host of private computer schools and training centres concentrated in Enugu and Nsukka.

Medicine

The University of Nigeria Teaching Hospital (UNTH) is located in Enugu State, as is the Enugu State University Teaching Hospital and College of Medicine. In addition to numerous private hospitals and clinics in the State, there are seven District Hospitals at Enugu Urban, Udi, Agbani, Awgu, Ikem, Enugu-Ezike, and Nsukka and at least one health centre or cottage hospital in every one of the seventeen (17) Local Government Areas and thirty-nine (39) Development Centres in the State.

1.1.2 FEDERAL AND STATE GOVERNMENTS ON POWER SECTOR

The vision of the Federal and State Governments in the electric energy sector development is to be most investor-friendly Services Provider. Their mission is to create opportunities for all and operate highly efficient Governments by providing competitive incentive schemes, excellent support facilities and services (granting permits and licenses) for the purpose of creating enabling environment for the construction of the aforementioned Power Plant.

Several factors are responsible for the adoption of the Federal and State Governments electric energy development scheme, among which are the diversification of the revenue base of the economy and employment generation and to encourage import of goods and export through local production. The Federal and State Governments will approve and grant all licenses and permits to the exclusion of all other Governmental Agencies, enforce obedience and compliance to rules and regulations. In effect, the Federal and State's laws, which permit the Authority, their Boards, the Developer and the Project Owner to define the policy directions of the Project operation and provide one-stop-shop business transaction without bureaucracy.

A new dimension has been added to the propagation of the scheme and this involves private Sector participation and partnership with the Federal Government and other tiers of government, called the Private Public Partnership (PPP).

Thanks for the democracy, Nigeria is taking its rightful place as the preferred investment destination in Africa. Astute investment both; local and foreign are scoring the land of Unity in diversity and taking advantage of the opportunities it offers. When the Project is fully operational, Enugu State would have taken the lead in opening a large window of high living standard changes with the continent.

1.1.3 CONLCUSION

The demographic, historical, economic and political analysis and study show that Enugu is a state with huge investment opportunities because it is one of the most peaceful and

stable in Nigeria due its strategic geographical location. Besides, Enugu has the following investment potentials:

- one of the fastest growing economies in Nigeria;
- huge potentials for increased Return on Investment (ROI);
- The world bank recently rated Enugu as second most advanced State towards Ease-of-Doing Business;
- Enugu's weather climate is topnotch for agricultural and farming business; other investment opportunities include agricultural, manufacturing, healthcare, tourism, energy, mining, real estate, transportation and more.
- Enugu's technology investment in opportunities has immense benefits;
- The State has many educated, energetic and vibrant labourers, which is a very important investment factor for the Free Trade Zone.

So, the implementation of this 10 MWh IGCC Power Project in Enugu, under export credit or export investment credit (Buyer's Credit or Seller's Credit) contributes largely to the financial and technoeconomic viability of this Project.

1.1.4 THE PROJECT

1.1.4.1 Power Plant Description

The project consists of the Bankable development and implementation of embedded 10 MWh IGCC power plant for the **Enpower Free Trade Zone** located at 9th Mile Corner, Enugu State, Federal Republic of Nigeria. The Plant shall be built on **1.6ha of Land** with the provision of possible expansion to higher capacity. The technoeconomic development of the project shall provide two (2) design proposals of the power plant: 1) Coal Gasification (CG) power plant; and 2) Integrated Gasification Combined Cycle (IGCC) power plant. **The design philosophy of the power plant consists of two (2) variants.** The **first variant** (or **variant A**) shall consist of three (3) High performance MWM TCG 2032 V12 Genset of total capacity or power output of 3,333Wh (cca.3.333 MWh), while the **second varian**t (or **variant B**) the IGCC power plant shall be provided with Two (2) High performance **Genset (MWM TCG 2032 V12)** Genset and 1 x standard **single-stage Steam Turbine (D-R SST 350 / 500 / 700)** of total power output of 3,500 kW (3.50MWh). The Total installed capacity or power output of Variant A and Variant B are respectively 9.999 MWh (≈ 10 MWh) and **10.166 MWh (10.17 MWh)**. Both types of power plant are among the most environmentally friendly in the world, but the quantity of coal and gas used in Variant A is 1/3 higher than the quantity the quantity of coal used in Variant B. Due to the Steam Turbine used in Variant B, the EPC contract of Variant B is a bit higher, **but more economically and more environmentally friendly viable than Variant A**. Therefore, for the purpose of this **Project Administration Manual (PAM)** and the **Technoeconomic Feasibility Development** of the Project, **Variant B** shall be applied.

The IGCC power plant is a very simple process, the produced syngas from the Gasifier is first cleaned and directly burned as fuel in the combustion Genset, which then drives the Three-phase MJH 800MC6 Synchronous Generators.

The Integrated Gasification Combined Cycle (IGCC) is a process whereby a hydrocarbon feedstock (coal) is converted into gaseous components by applying heat under pressure

in the presence of steam. Rather than burning, most of the carbon-containing feedstock is broken apart by chemical reactions that produce "syngas." Syngas is primarily hydrogen and carbon monoxide, but the exact composition can vary. In Integrated Gasification Combined-Cycle (IGCC) systems, the syngas is cleaned and burned as fuel in a combustion turbine which then drives an electric generator. Exhaust heat from the combustion turbine is recovered and used to create steam for a steam turbine-generator. The use of these two types of turbines in combination is one reason why gasification-based power systems can achieve high power generation efficiencies. Currently, commercially available gasification-based systems can operate at around 40% efficiencies. Coal gasification (clean energy of the future) is also water intensive. According to the Gasification and Syngas Technologies Council, a trade association, there are globally 272 operating gasification plants with 686 gasifiers and 74 plants with 238 gasifiers under construction. Most of them use coal as feedstock.

Furthermore, the discharge of solid by-products and waste waters is reduced roughly by 50% versus other coal-fed plants, and the by-products generated (mainly **slag** and **sulphur**) are environmentally benign and can be sold

This embedded power generation, also called or autoproducer, is an electricity generation facility used and managed by an industrial or commercial energy user for their own energy consumption. Embedded Generation is simply a generation of electricity for local distribution and consumption. It can also be connected to the electric grid to exchange excess generation. The development of embedded generation has an important part to play in meeting the Government's long term environmental targets. Some of the advantages of Embedded Power Generation include:

1) the reduction in transmission losses;
2) the reduction in construction cost;
3) environmental concerns;
4) prevention of excessive supply of electricity to the grid;
5) stability and reliability; and
6) supply and demand matching.

Infrastructures and Facilities

The IGCC power plant shall be provided with the following operations facilities (*see* **section 1.2.2.3** for detailed information):

1) Power Generation Hall – PGH;
2) Own Integrated Wastewater Treatment Plant (WTP), depending on the quality of the available water and its cost from the public water distribution systems;
3) Coal Storage and Treatment Hall – CSTH;
4) Residues Collection, Treatment, Disposal and Package Hall (RCTDPH)
5) Administration Building – AB;
6) Internal Parking Spaces (IPS) for staff only and coal delivery trucks; and
7) External Parking Area (EPA) for visitors.

The water shall be piped from Orji River situated at a distance of cca. 20 km from the power plant. For economic purposes, the power plant may use the underground water as

a backup water supply. This underground does not require any further treatment. It has been mapped as one of the cleanest underground waters in the world.

The plant shall be built for a period of **12-18 months** as provided in the Project Implementation Milestone, **Section 4.8**.

Fuel Data Analysis – Primary and Secondary Fuels

The quality of this coal was provided by the Chairman of XENERGI LTD. It was based on the laboratory report No. 2020/0002 issued by NIGERIAN GEOLOGICAL SURVEY AGENCY (National Geosciences research Laboratory (NGRL) in Kaduna). But, as provided in Table 1 below, there are some missing important data such High Heating Values (HHV), methane, and Carbon Monoxide (CO).

Table 1-1: Coal Quality Specifications

Parameter	Value
Total moisture, Wr (%)	6.15
Ash, Ar (%)	11.05
Total sulphur, Sr (%)	0.58
Calorific value, LHVr (kJ/kg)	20,675.42
Moisture, Wa (%)	N/A
Ash, Aa (%)	N/A
Volatiles, Va (%)	N/A
Heat of combustion, HHVa (kJ/kg)	N/A
Calorific value, LHVa (kJ/kg)	N/A
Sulphur, Sa (%)	0.58
Carbon, Ca (%)	65.87
Hydrogen, Ha (%)	4.97
Nitrogen, Na (%)	1.26
Oxygen, Oa (%)	10.13

The evaluation of the coal quantity was based on the most accurate method, using the fuel consumption data from the manufacturers and a fuel of known properties procedures provided by XENERGI LTD. The verification of data was based on the **Stoichiometric Modelling** provided in table 1-2 below.

Although over one hundred chemical compounds take part in the gasification process, in the presented model only eight substances, which are considered **C**, **CO**, **CO**, **HO**, **H**, **CH**, **O** and **N**.

Nitrogen is treated as inert, so seven compounds, formed from three elements, participate in conversions. Therefore, the model was determined by four independent reactions. **Usually, the following reactions are used in equilibrium simulations**.

Table 1-2: Stoichiometric Modelling

Eq.	Name	Chemical Reaction	Energy
1	the Boudouard reaction	$C + CO_2 \rightarrow 2CO$	+172 MJ/kmol
2	the water gas reaction:	$C + H_2O \rightarrow CO + H_2$	+131MJ/kmol
3	the methanation reaction:	$C + 2H \rightarrow CH_4$	–75 MJ/kmol
4	the water gas shift reaction:	$CO + H_2O \rightarrow CO_2 + H_2$	–41MJ/kmol

NOTE 1:
When considering the quality specifications of your coal, you can see that we have only four (4) components. Besides, we do not have any data on the high heating value (HHV_{coal}), which is a very important data for the combustion of the coal and Syngas. The preliminary analysis of the coal specifications we received from you shows that your coal has a good Heating Value for coal-fired power generation and very poor chemical composition for the production of syngas.

Main requirement for the combustion of gas

The combustion gas refers to gas mixtures, which are suitable for turbine/genset operation and differ in their composition. The most important main components are:

- **Methane (CH_4)**
  - as an essential heating value carrier of the usual combustion gases,

- **chained hydrocarbons (C_nH_m with n greater than 1)**
  - which have a strong tendency towards knocking combustion,

- **inert gases (N_2 and CO_2)**
  - which do not actively participate in the combustion. Inert gases increase the methane number in a combustion gas. This increases the methane number in CO_2 with the triple effect of N_2,

- **Hydrogen (H2)**
  - which considerably reduces the methane number of the combustion gas.

NOTE 2:
As you can see here in this section, your coal dot not contain the most important combustion elements like methane and any or hydrocarbons (CH_4) and (C_nH_m with n greater than 1).

Accompanying substances

The gas accompanying substances are also very important in the assessment of suitability as a combustion gas. They make no significant contribution to the combustion energetically. However, these gas accompanying substances must be taken into account with regard to the reliable operation of the overall system.

In addition to the gas accompanying substances which do not change the combustion process, there are also substances which lead to a change in the ignition properties (such as oil fumes).

Other gas accompanying substances are significant because of the combustion products such as ashes or deposits. These are elements and compounds which contain silicon, halogens, metals, etc.
Although the accompanying substances only occur in traces, the combustion products can cause wear.

Depending on the amount and damage effect, these gas accompanying substances must be eliminated from the combustion gas before entering the gas control line.

Examples: The syngas should not be mixed with any of the following elements or with gas containing these elements.

- **Hydrogen sulphide H_2S** from *e.g.* biogas combusts to SO_2 and H_2O. These two intermediate products react to sulphurous acid H_2SO_3. A further reaction to sulfuric acid H_2SO_4 is possible in the oxidation catalyst. The acids formed in the combustion cause the lube oil to become acidified, which leads to the lube oil replacement intervals becoming shorter. Furthermore, sulphurous and sulfuric acid can condense in the exhaust heat exchanger and lead to deposits and corrosion occurring there.

- **Silicon connection hexamethylcyclotrisiloxane D_3 $(CH_3)_6Si_3O_3$** *e.g.* from landfill and sewage gas combusts to silicon dioxide SiO_2 (quartz sand), CO_2 and steam. Silicon dioxide forms deposits on all components surrounding the combustion chamber, which leads to abrasive wear. Furthermore, the deposits cover the exhaust catalyst and deactivate it.

- **Chloroform $CHCl_3$** *e.g.* from landfill gas reacts to hydrochloric acid, carbon dioxide and steam. This hydrochloric acid pressurizes the lube oil and corrodes components.

Quantity of Coal and Syngas required

Based on the specifications of this Syngas Genset, the heating value of the syngas are as given in the table below.

	Min. HV	Typical HV	Max. HV
MJ/m³	**15.7613**	**17.7171**	**19.6729**
MW/m³	0.2627	0.2953	0.3279

The minimum Quantity of Syngas (Q_{SYNGAS}) required for the generation 10MWh

- **Q_{SYNGAS}** for **HV_{SYNGAS} = 15.7613 MJ/m³**
  We have the following inputs:
  - Thermal Efficiency (TE): 96%
  - If the thermal efficiency is 0.75%, then the flow rate shall be **816.60m³**.

The minimum Quantity of Coal (Q_{COAL}) required for the generation cca. 10MWh

The total quantity of Syngas required per year for the generation of a total power out of 10MWh shall be **21,460,248 m³**.

To meet the combustion requirements of the syngas, the following gases and respective quantities shall be injected to the syngas produced from your coal:

a) Methane (HHV 39.76MJ/m³) – 22% of 21,460,248 m³ (*i.e.* 4,721,254.56 m³); and
b) Hydrocarbon (HHV 12.76MJ/m³) – 1% of 21,460,248 m³ (*i.e.* 214,602.48 m³).

So, the total quantity of additional combustion gases is: **ADDITIVE = 4,935,857.04 m³**. Another suitable gas such as Natural Gas, LNG, LPG, Biogas, Landfill Gas, Sewage Gas, Coke Oven Gas, Mine Gas, Propane or Associated Gas of the same quantity and quality i.e. (a minimum Heating value of **39.76MJ/m³**).

Quantity of Coal Required

The quantity of coal with a heating value of 20, 676.41 KJ/Kg for the 3 x 3.333 MWh (≈10MWh = 10,000kWh) per year is: **Qcoal = 87,591.24 ± 5%** MT / year.

From the obtained coal, we have**: ΔH_{min} ($2m^3$ syngas) =** 1.27MJ/m^3
For the Genset: **ΔH_{min} ($2m^3$ syngas) =** 31.52 MJ/m^3.

a) The quantity of Syngas generated by 1kg of coal (20,675.42 kJ/kg) is: 0.61 m^3.
b) The coal assumption used is 1 kg of coal of high heating value generate 2 m^2 of syngas of a minimum heating of 15MJ/m^3. The calculated results from this assumption give 1.363 Nm^3 (1.40 Nm^3) of syngas.

c) The calculation of the heating value of volume of syngas calculated uniquely from the received coal data is 0.61 m^3 (0.60 m^3). The sum of these values gives: 0.61 m^3 + 1,363 m^3 = 1.973 (≈ $2m^3$), which corresponds to the exact assumed value.

Main Equipment of the Power Plant

- **The Genset TGC 2032 V12**

  This is the preliminary selected Syngas Genset due to its reliability, efficiency and economic operation. **TGC 2032 V12** operates with all types of gas, which are available in Nigeria, including syngas.

  This IGCC power plant project is the first project of its kind the whole Africa and in Nigeria, besides the huge coal deposit in Nigeria and particularly in Enugu (also known as the call state of Nigeria), where this project is being implemented.

  More profit. The optimized maintenance concept with cylinder units simplifies accessibility and, along with the reduction of the number of different parts, minimizes the time required for maintenance. This saves up to 20% in service costs. At the same time, you profit from up to 30 % less lubricating oil consumption compared to other engines.

  Longer runtimes. Thanks to the extended service intervals, the TCG 2032 runs up to 200 hours longer per annum than comparable products. The major overhaul is scheduled after 80,000 operating hours.

  Greater reliability. The particle-free combustion with chamber plugs extends the service intervals for the exhaust gas heat exchanger and reduces service costs compared to other combustion methods.

  Major components such as pistons, conrods, spark plugs and cylinder heads have been improved to withstand the greater power output and deliver increased electrical efficiency.

Technical Data of the Genset

Table 1-3: Technical data and fuel chemical composition requirements

Parameter	Value	
Electrical power	kW	3,333.0
Mean effective pressure	bar	20.0
Thermal output	kW	3,238.0
Electrical efficiency	%	43.9
Thermal efficiency	%	42.6
Total efficiency	%	86.5
Length	mm	7,860
Width	mm	2,660
Height	mm	3,390
Dry weight genset	kg	43,100

	Minimum	Minimum	Minimum
Carbon dioxide (CO_2) in %	1	2	4
Ethane (C_2H_6) in %	0.5	1,5	3
Methane (CH_4) in %	22	25	28
Carbon monoxide (CO) in %	3	5	7
Hydrogen (H_2) in %	**52**	**56**	**60**
Nitrogen (N_2) in %	**8**	**10**	**12**
Oxygen (O_2) in %	**0**	**0.5**	**2**

Optimum efficiency. The interaction of all components has been improved even further. All components relevant for efficiency and power output are monitored by the TEM (Total Electronic Management). The new, upgraded wastegate in particular ensures a more efficient operation with changing conditions. This is also the case when the gas composition is fluctuating – thanks to fast response times due to the temperature monitoring for each cylinder. TEM not only controls the engine, but the entire system, including heat extraction.

Full turbo power. The high-pressure turbocharger A140 with an improved wastegate allows operation with a broader air intake temperature range and up to higher altitudes.

- **Steam Turbine (D-R SST 350 / 500 / 700)**

Standard Dresser-Rand SST Turbines are single-stage, impulse-type turbines with a two-row, velocity-compounded rotor and one row of stationary reversing blades between the rotating blades. The rotor is contained within a horizontally split (axially split) casing, with steam inlet and exhaust connections located in the lower half of the casing assembly.

The rotor is supported between two sleeve bearings and positioned axially by a ball thrust bearing or tilt pad thrust bearing, or it is supported between two ball bearings and positioned axially by a ball thrust bearing. Other variations of the turbine include extended inlet pressure and temperature constructions and/or a high back pressure construction.

Steam enters the turbine casing after first passing through the built-in steam strainer, the throttle valve and the overspeed trip valve. The turbine inlet casing incorporates the nozzle ring, which contains several individual steam nozzles.

Some of these nozzles are controlled by hand-valves for partial load or overload conditions. Steam flowing through the nozzles expands and is directed at high velocity against the rotating blades of the first row on the turbine rotor. After passing through the first row, stationary reversing blades redirect the steam against a second row of rotating blades. The steam is then discharged into the exhaust casing and from there into the user's exhaust piping at the exhaust system pressure.

Optionally, the turbine may be supplied with a single row rotor, in which the case stationary reversing blades are not provided. This Steam Turbine (ST) is a standard single-stage steam turbine, consisting of:

- Rugged, versatile design
- Woodward TG Oil Relay NEMA Class A constant speed governor or electronic governor
- Horizontally split casing with centreline support
- Overspeed mechanical trip valve, separated from governor valve
- Carbon ring or labyrinth sealing glands
- Built-in, removable steam strainer
- API style blanket lagging / insulation (API applications)
- Oil ring with forced pressure lubrication or circulating oil cooling options
- Rolling element or tilting pad thrust bearings
- Broad range of controls and accessories available
- WORTHINGTON heritage (D-R SST 350 / 500)

Table 1-4: Technical data of the Turbine

Parameter	Value	
Electrical power output	kW/HP	3,500 / 4,690
Turbine Speed	rpm	≤ 12,000
Inlet steam pressure	bar(a) / psi	63 / 914
Inlet steam temperature	°C / °F	≤ 482 / 900
Back pressure	bar(a) / psi	202 / 315
Bearings	Sleeve	-
Type blades	Impulse	-
API	-	611 & 612

- **Generator (Marelli)**

Three (3) generators is required, having each a total power output of 3.333 MWh. Each Genset and the Steam Turbine (ST) shall be connected to a Three-Phase Synchronous Generator MJH 800MC 6. The technical data of the Generator for a frequency of 50 Hz and a speed of 1,000 rpm are provided in table 1-5 below. (Standards : VDE 0530 ; IEC 60034-1 ;BS 4999-5000).

Table 1-5: Technical data of the Generator

Parameter	Value	
Frequency	Hz	50
Protection degree	-	IP 23
Power factor	-	0.8
Overspeed	rpm	1,300
Number of terminals	-	6
Cooling temperature	°C	40
Cooling air volume	-	IC 01
Altitude at side	m	1,000
Inertia	Kgm^2	769
Total losses	kW	124.5
Radiated heat	kW	6
Weight	kg	18,400
VOLTAGE (± 10%)	V	10,500
CURRENT	A	294
RATED POWER (@ 0,8 p.f.)	kVA	5,338
EFFICIENCY	%	100-110
Dimensions (mm)	L x W x H (3,590 x 2.060 x 1,760)	

- **Accessory Electric Plant**

The accessory electric plant consists of switchgear and control equipment, generator equipment, station service equipment, conduit and cable trays, and wire and cable. It also includes the main power transformer, required foundations, and standby equipment.

Switchgear. The Embedded Power Generation Project shall be provided with its integrated Distribution Network, consisting of the construction of (i) 15 km of low-voltage 33 kV lines (main evacuation lines from the power station); (ii) 15 km of low-voltage 11 kV lines; (ii) 15 km of low-voltage 0.4 kV lines; (iii) the purchase and installation of 20 transformer stations; (iv) 10,000 smart prepaid meters for connecting 10,000 new customers, and a 1,000 galvanized Steel Power Poles.

Instrumentation and Control. An integrated plant-wide control and monitoring DCS is provided. The DCS is a redundant microprocessor-based, functionally distributed system. The control room houses an array of multiple video monitor and keyboard units. The monitor/keyboard units are the primary interface between the generating process and operations personnel. The DCS incorporates plant monitoring and control functions for all the major plant equipment. The DCS is designed to provide 99.5% availability. The plant equipment and the DCS are designed for automatic response to load changes from minimum load to 100%. Start-up and shutdown routines are implemented as supervised manual, with "operator selection of modular automation routines available.

1.1.4.2 Free Trade Zone Construction Site Layout

Based on the proposed location (Fig. 1.2) of the Power Plant, the Project Company, XENERGI LTD shall provide the following data: 1) **Topographic Map**, indicating the sea levels; 2) **Free Trade Location Map**, showing the most important neighbouring sites like Heineken brewery, highways, access roads, rivers, evacuation canals, etc.; and 3) Soil Test of the selected **1.6 ha** of land area.

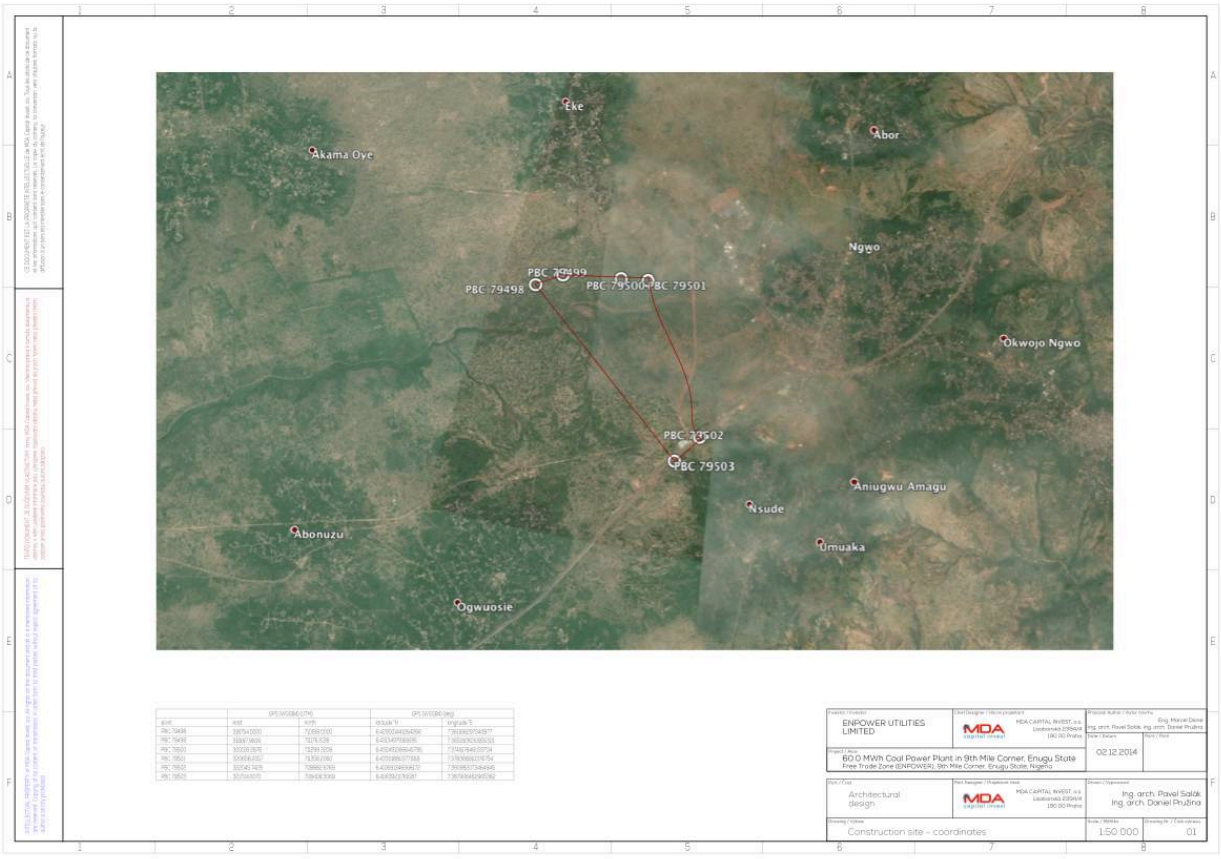

Fig. 1.2 – Free Trade Zone Layout from Google coordinates

Fig. 1.3 – Free Trade Zone Layout showing the Power Plant Construction Site Layout

1.1.4.3 Power Plant Design Preview

Fig. 1.4 – 3D Top-View of the Power Plant

Fig. 1.5 – 3D Top-View of the Power Plant – Storeroom

NOTE:
This location is very strategic, due to accessibility to highways for easy supply of raw materials, and delivery of technologies and equipment. Besides, it eases the connection of the plant to external important infrastructure or facilities as for instance, piping raw water from Oji River located at 20 km from the site. This is more economically feasible than extracting the underground water, which is used for the brewery.

1.1.4.4 Design Philosophy

Generally electric power plants fall into several categories and classes depending on the type of prime mover. The **10.20 MWh iGCC** power plant design philosophy shall be carried to meet the following customer benefits:

1) Reliability;
2) Simple maintainability; and
3) Future expansion.

Reliability

Plant reliability standards will be equivalent to a **1-day generation forced outage in 10 years** with equipment quality and redundancy selected during plant design to conform to this standard.

Simple Maintainability

Power plant arrangement will permit reasonable access for operation and maintenance of equipment. Careful attention will be given to the arrangement of equipment, valves, mechanical specialties, and electrical devices so that rotors, tube bundles, inner valves, top works, strainers, contractors, relays, and like items can be maintained or replaced. Adequate platforms, stairs, handrails, and kickplates will be provided so that operators and maintenance personnel can function conveniently and safely.

The powerhouse shall be provided with enough access areas to engines, turbines and generators for easy maintenance services. At least a 5m distance between Steam Turbines (STs) foundation boundaries and walls shall be required.

Future expansion

The specific site selected for the power plant and the physical arrangement of the plant equipment, building, and support facilities such as fuel and oil wastes handling systems, circulating water system, scrap storage room, spare parts store, trackage, and access roads, etc. will be arranged insofar as practicable to allow for future expansion.

1.1.4.5 Design Criteria

General requirements

The design will provide for a power plant, which has the capacity to provide the quantity and type of natural gas power plant (in the case of simple cycle power plant), steam and compressed air (in the case combined cycle power plant) required. Many of the requirements discussed here are not applicable to each of the plant categories of Table 1-6. A general overview is provided in Table 1-7 below.

Electric power loads

The following information, as applicable, is required for design:

1) Forecast of annual diversified peak load to be served by the project;

2) Typical seasonal and daily load curves and load duration curves of the load to be served;

3) If the plant is to operate interconnected with the local utility company, the designer will need information such as capacity, rates, metering, and interface switchgear requirements;

4) If the plant is to operate in parallel with existing generation on the base, the designer will also need:
   a) An inventory of major existing generation equipment giving principal characteristics such as capacities, voltages, steam characteristics, back pressures, and like parameters;
   b) Incremental heat rates of existing boiler-turbine units, diesel generators, and combustion turbine generator units; and
   c) Historical operating data for each existing generating unit giving energy generated, fuel consumption, steam exported, and other related information.

5) Existing or recommended distribution voltage, generator voltage, and interconnecting substation voltages;

6) If any of the above data as required for performing the detailed design is unavailable, the designer will develop this data.

Export of steam

1) If the plant will export steam, information similar to that required for electric power, as outlined in subparagraph c) above, will be needed by the designer.

2) Coordination of steam and electric power loads. To the greatest extent possible, peak, seasonal, and daily loads for steam will be coordinated with the electric power loads according to time of use.

NOTE:
*The power plant may export **steam**, **chilled** and **hot water** to the existing Heineken Brewery located at a cca. 200 m from plant, or to the proposed purified bottled water plant, houses, industrial and commercial facilities to be built in the Free Trade Zone.*

Table 1-6: Design Criteria Requirements

Class (Plant Category)	Electric Power Load	Export Steam Load	Fuel Source and Cost	Water Supply	Stack Emission	Waste Disposal
A (Primary)	A	A	A	A	A	A
B (Standby)	A	N/A	A	N/A	N/A	A
C (Emergency)	Critical Load Only	N/A	A	N/A	N/A	N/A

NOTES:
- *A: Available*

- *N/A: Not Available*
- *This type of information is particularly important if the project involves cogeneration with the simultaneous production of electric power and steam.*

Table 1-7: General Description of Type of Plant

TYPE OF POWER PLANT				
S/N	**Category**	**Capacity**	**No Export Steam**	**With Export Steam**
1	Primary	Adequate to meet all peacetime requirement.	Purchased electric power to match electric load	Not stated Purchased electric power and steam to match electric load plus supplementary boiler plant to match export steam load.
			Continuous duty diesel plant, Class “A” diesel.	Automatic back pressure steam plant plus automatic packaged fire tube boiler to supplement requirements of export steam load.
			Straight condensing boilers and turbines matched in capacity as units; enough units so plan without largest unit can carry emergency load	Automatic extraction steam plant boilers and turbines matched in capacity se units and enough units installed so that plant without largest unit can carry emergency load.
2	Standby	Adequate with prime source to match mobilization needs; or alone to supply emergency electric load and export steam load in case of primary source out age.	Purchased electric power.	Purchased electric power and steam to match electric power load plus supplementary boiler plant.
			Standby diesel plant, Class “B” diesel.	Standby diesel plant with supplementary boilerplant.
		Equal to primary source . . .	Retired straight condensing plant.	Retired automatic extraction steam plant.
3	Emergency	To supply that part of emergency load that cannot be interrupted for more than 4 hours.	Fixed emergency diesel plant, Class “C” diesel.	None
			Mobile utilities support equipment.	None

Water Supply

Fresh water is required for **thermal cycle makeup** and **for cooling tower or cooling pond makeup** where once through water for heat rejection is unavailable or not usable because of regulatory constraints. Quantity of makeup will vary with the type of thermal cycle, amount of condensate return for any export steam, and the maximum heat rejection from the cycle. This heat rejection load usually will comprise the largest part of the makeup and will have the least stringent requirements for quality.

Stack Emission

A steam electric power plant will be designed for the type of stack gas clean-up equipment, which meets federal, state, and municipal emission requirements. For a solid fuel fired boiler, this will involve an electrostatic precipitator or bag house for particulate, and a scrubber for sulphur compounds unless fluidized bed combustion or compliance coal is employed. If design is based on compliance coal, the design will include space

and other required provision for the installation of scrubber equipment. Boiler design will be specified as required for NO_x control.

The Major Gasification By-products (experiences learn from existing IGCC plants)

Slag and Ash. As discussed in the Background, solid waste from conventional pulverized coal-fired power plants is a significant environmental issue due to the large quantities produced, chiefly of coal fly ash, and the potential for leaching of toxic substances (*e.g.* heavy metals such as lead and arsenic) into the soil and groundwater at disposal sites, and accidental releases from coal ash ponds.

As opposed to conventional coal combustion, many types of coal gasification produce very little fly ash. This is a benefit of gasifiers operated at temperatures higher than the fusion point of ash (slagging gasifiers or agglomerating gasifiers, which include the most prominent coal gasification processes incorporated into IGCC such as GE Energy, E-Gas and BGL, etc.). At such high temperatures, most of the mineral matter of the coal is transformed and melted into slag, an inert glass-like material. Under these conditions, non-volatile metals and mineral compounds are bound together in molten form until the slag is cooled in a water bath at the bottom of the gasifier, or by natural heat loss at the bottom of an entrained bed gasifier. Volatile metals such as mercury are typically not recovered in the slag, but may be removed from the raw syngas during cleanup. Slag production is a function of ash content, so coal produces much more slag than petroleum coke. Regardless of the feed, as long as the operating temperature is above the fusion temperature of the ash, slag will be produced. Its physical structure is sensitive to changes in operating temperature and pressure, and physical examination of the slag's appearance can often be a good indicator of carbon conversion in the gasifier.

More precisely, **slag** is comprised of black, glassy, silica-based materials (also known as "frit", a high density, vitreous, and abrasive material low in carbon and formed in various shapes from jagged and irregular pieces to rod and needle-like forms) and residual carbon char, the proportions of which vary depending on operating conditions, gasifier, feed, etc. The two parts can be separated (they are not chemically bonded) and concentrated into carbon rich char and vitreous frit. Char has its own current and potential uses; see the following discussion. Vitreous **slag** is much preferable to ash, because of its habit of encapsulating toxic species (such as heavy metals) into a stable, non-leachable material. Leachability data obtained from different gasifiers unequivocally shows that gasifier slag is highly non-leachable, and can be classified as non-hazardous. Because of its particular properties and non-hazardous, non-toxic nature, **slag is relatively easily marketed as a by-product for multiple advantageous uses, which may negate the need for its long-term disposal**. Obviously, both the profit from using slag as a by-product and avoidance of disposal costs combine to improve the economics of the disposition of slag, which is the major solid by-product from gasification processes.

In summary, the high temperatures and pressures of gasification processes have the potential to turn mineral matter within the feedstock into slag instead of the ash that is produced in combustion. **Slag captures toxics/heavy metals and does not allow them to leach out of the material**, unlike combustion ash from which toxic species can possibly leach and find their way into groundwater and surrounding soils.

Char. Char is the finer component of the gasifier solid residuals, composed of unreacted carbon with various amounts of siliceous ash. It can be recycled back into the gasifier to increase carbon usage and has been used as a supplemental fuel source for pulverized coal combustion. The irregularly shaped particles have a well-defined pore structure and have excellent potential as an adsorbent and precursor to activated carbon. In a project between the Department of Energy (DOE) and CAER, potential uses of char were investigated, specifically as **adsorbers for emissions control**. Carbon char has the potential to **control mercury (Hg) and nitrogen oxides (NOx) emissions**. To test for mercury adsorption (an initial study only) a mercury vapour generator and a fixed bed reactor were used. A gas sampling system and vapour analyser were used to assess the char's performance. Untreated gasifier char was found to be as effective at adsorbing mercury as a **commercially available activated carbon designed for Hg adsorption**. Interestingly, all attempts to increase the porosity of the gasifier char lessened its adsorption potential, which seems to be related to the **char mineral content (mainly SO_{4-2} and Cl-)**. Not having to treat the char is significant, as **treatment would be an additional cost**.

Additionally, gasification char adsorbed significantly more NOx than all other test materials except for a specially designed activated carbon NOx adsorber. For this test a thermal analyser and mass spectrometer were used. The char performed 30% as well as the specially designed activated carbon adsorber. After increasing the surface area of the gasifier char, it increased NOx capacity, while char that was laden with Hg adsorbed more NOx than Hg-free char. This presents the possibility of using gasifier char to adsorb Hg while also adsorbing some NOx prior to an activated carbon NOx adsorber. Naturally, the gasifier char, a "waste," is significantly less expensive than a specialty adsorber and being able to put it to good use makes plant operations more economical.

Sulphur. Sulphur products are collected, cooled and condensed, generating low pressure steam. Condensed sulphur product is stored in an underground molten sulphur pit, where it is later pumped to truck loading for shipment. Claus tail gas from the last stage sulphur condenser is sent to a tail gas treatment unit to remove unconverted H_2S, SO_2, and carbonyl sulphide (COS) before disposal. The option to recover sulphur in the form of sulfuric acid (H_2SO_4) is practiced **at Tampa Electric's IGCC demonstration plant** (See Fig. 1.6), given the local demand for sulfuric acid for fertilizer manufacture in this area of Florida. Figure 1.6 shows a simplified flow of the Tampa Electric IGCC sulfuric acid plant. The sulfuric acid plant receives the hydrogen sulphide (H_2S) from the **acid gas recovery** unit and H_2S and ammonia from the water stripper. The gas streams are then burned in a decomposition furnace, where the H_2S produces primarily **sulphur dioxide (SO_2)** with trace amounts of **sulphur trioxide (SO_3)**, sulfuric acid and elemental sulphur and the ammonia is converted to **nitrogen (N_2)** and water. The decomposition furnace exit gas is cooled from about 1,950°F to 650°F in a waste heat boiler to produce medium pressure steam for in plant use. The gas is then further cooled and dried. This step produces a 'weak acid' waste stream which needs to be neutralized before discharging into the cooling pond. The SO_2 and oxygen (from either air or an air separation plant) then react over a vanadium-based catalyst bed in a converter according to the following reaction:

$$SO_2 + ½\ O_2 \rightarrow SO_3$$

The produced SO_3 is then reacted with water as follows:

$$SO_3 + H_2O \rightarrow H_2SO_4$$

The catalytic oxidation of SO_2 to SO_3 is highly exothermic, and the equilibrium becomes increasingly unfavourable for SO_3 formation as temperature increases to about 800°F. For this reason, special catalytic converters (reactors) are designed as multistage reactor bed units with air cooling between each bed for temperature control.

Gas from the final reactor beds enters the absorbing towers, where the produced SO_3 reacts with the excess water in a circulating, strong (98%) sulfuric acid stream, creating additional H_2SO_4. This incrementally raises the concentration of the sulfuric acid so that water is introduced as needed to maintain the H_2SO_4 at 98.5% as the final product. **The Tampa Electric** sulfuric acid plant is very efficient, converting over 99.5% of the incoming H_2S to H_2SO_4.

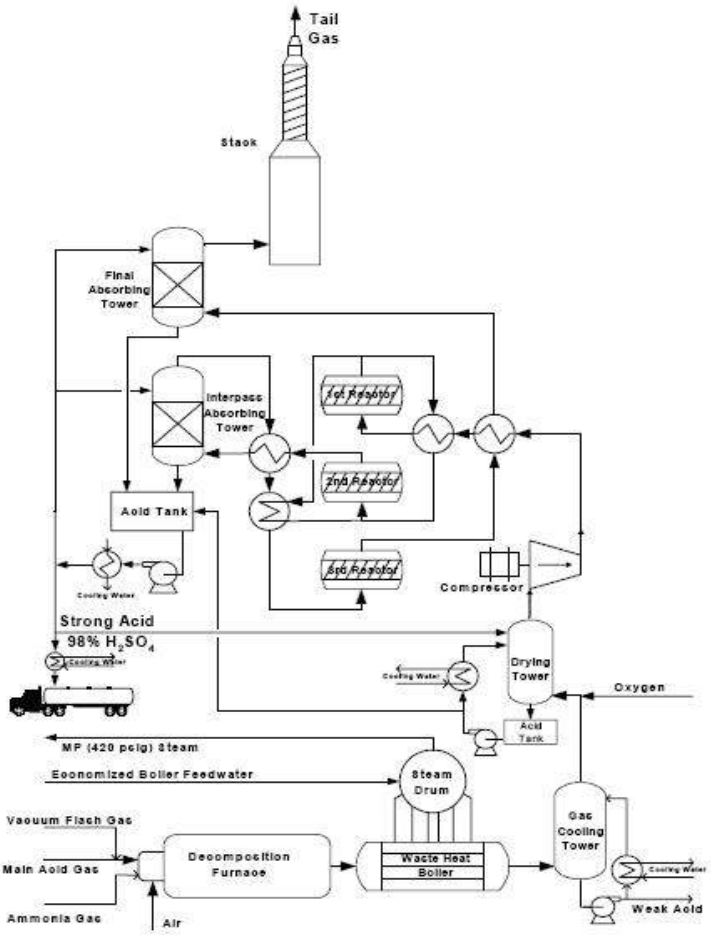

Fig. 1.6 – Tampa Electric IGCC Sulfuric Acid Plan Flow Diagram

NOTE:
Coal gasification processes can produce three types of ash: fly ash (including char or unreacted fuel), bottom ash, and slag, with most of the solid by-product ending in form of slag for high-temperature gasifiers. Non-slagging gasification produces a coarse bottom ash and fine fly ash. While the amount of fly ash varies according to the type of gasification process, it is often recycled to consume the char and minimize the quantity of fly ash produced. Therefore, the ratio of slag or bottom ash to fly ash is usually much higher in IGCC plants than it is in combustion-based plants in any case.

By-products Evaluation

All the residues generated from this **10 MWh IGCC** power plant constitute the main by-products (commodities) with defined international markets. Off-course, the collection, treatment, disposal and packaging of these commodities require additional technologies and space, which therefore increase the cost of the power plant. However, the integration of these advanced and progressive technologies adds values to project, making it more **techno-economically and environmentally viable**.

Table 1-8: Daily input and output values from various IGCC plants

IGCC Plant	Capacity [MWh]	Coal (MT/d)	Slag (MT/d)	Char [MT/d]	Particulates [MT/d]	Sulphur [MT/d]
	10	x	x	x	x	x

Wastewater Treatment Plant

The power plant shall be provided with its own integrated Wastewater Treatment Plant (WTP) for the collection, treatment and reuse of the liquid wastes generated from the Gasifier (which is water intensive, cca. 50% of the quantity of water used in conventional coal power plant or coal-fired power plant) and from the combustion Gensets and Turbine.

The **liquid wastes** include the Gasifier blowdown, Boiler blowdown, Cooling Tower blowdown, acid and caustic water treating wastes, coal pile runoff, and various contaminated wastes from chemical storage areas, sanitary sewage and yard areas. These liquid wastes are also produced from the internal combustion Genset and Turbine generating station that will be disposed of as follows: Miscellaneous oily wastes from storage tank areas and sumps will be directed to an API separator. Supplementary treating can be utilized if necessary to meet the applicable requirements for wastewater discharge.

The clean water produced by the Wastewater Treatment Plant shall be used for the **gasification** and for the **cooling the Genset and Turbines**. The required quality specifications of the water are provided in **1.2.1.2** below (Water Supply).

NOTE:
both solid and liquid wastes will be handled and disposed of in an environmentally acceptable manner. For plants of size less than 1,000kW, liquid oily wastes will be accumulated in sumps or small tanks for removal. Residues from filters and centrifuges will be similarly handled.

Other environmental considerations

Other environmental considerations include noise control and aesthetic treatment of the project. The final location of the project within the site area will be reviewed in relation to its proximity to hospital and office areas and the civilian neighbourhood, if applicable. Also, the general architectural design will be reviewed in terms of coordination and blending with the style of surrounding buildings. Any anticipated noise or aesthetics problem will be resolved prior to the time that final site selection is approved.

1.1.4.6 Economic considerations

a) The selection of one particular type of design for a given application, when two or more types of design are known to be feasible, will be based on the results of an economic study in accordance with the technical, financial and legal requirements and local and international regulations.

b) The EU and International Standards for economic studies shall be applied. For instance, in the US, the applicable international Standards for economic studies are contained in AR 11-28 and AFR 178-1, respectively. Additional standards for design applications dealing with energy/fuel consuming elements of a facility are contained in the US Code of Federal Regulations, 20 CFR 436A. Clarification of the basic standards and guidelines for a particular application and supplementary standards, which may be required for special cases may be obtained through normal channels from HQDA (DAEN-ECE-D), WASH DC 20314.

1.2 SITE SELECTION AND CIVIL FACILITIES DESIGN AND CONSTRUCTION

1.2.1 SITE SELECTION

Since the selection of a site has a significant influence on the design, construction and operating costs of a power plant, we have proposed to choose a potential plant site as shown in Fig 1-2 above due to its strategic location and accessibility. The external connections and deliveries of goods and services shall be direct and not through the premisses of the Free Trade Zone. The Operation of the Power Plant should not disturb or obstruct other business activities within the Free Trade Zone. It should not also encumber the environment of the Free Trade Zone. The power plant shall be implemented in an area of **a length of 160 m and a width of 100 m** (**16,000 m^2 or 1.6 ha)**.

As already stated above, the Power Plant shall be implemented as an embedded power generation for the Enpower Free Trade Zone (EFTZ), which is located just at the periphery of the Enugu City (9th Mile Corner). The site is provided with very good standards access roads and highways. The underground water of the area does not need any further treatment. It is said to be one of the cleanest underground water in the world (*source*: UN World Food Program). The terrain is very plan, without hills and valleys. A stream is running across the lower side of the Plant. Due to environmental concerns, the underground water shall not be used is only reserve for human consumption and shall not be contaminated by the plant operation. Because of the quality and quantity of the underground water, the Heineken Brewery in Nigeria is located in that area.

1.2.1.1 Physical characteristics

Selection of the site will be based on the availability of usable land for the plant, including yard structures, fuel handling facilities, and any future expansion. Other considerations that will be taken into account in site selection are:

- Soil information;
- Site drainage;
- Wind data;

- Seismic zone; and
- Ingress and egress.

For economic purposes and operational efficiency, the plant site will be located as close to the load centre as environmental conditions permit.

1.2.1.2 Soil investigation

An analysis of existing soils conditions will be made to determine the proper type of foundation. Soils data will include elevation of each boring, water table level, description of soil strata including the group symbol based on the Unified Soil Classification System, and penetration data (blow count). The soils report will include recommendations as to type of foundations for various purposes; excavation, dewatering and fill procedures; and suitability of onsite material for fill and earthen dikes including data on soft and organic materials, rock and other pertinent information as applicable. **The project Company, XENERGI LTD / XENERGI CONSORTIUM, shall issue the Soil Test Data, based on which the Civil Engineering Company, EUROMADE ENGINEERING & CONSTRUCTION LIMITED (EUMEC) shall build the build the civil objects of the Power Plant, including the foundations for the installation of the technologies (Gasifier, Boiler and Genset)**.

1.2.1.3 Site development

Grading and drainage.

1) **Basic criteria**. Determination of final grading and drainage scheme for a new power plant will be based on a number of considerations including size of property in relationship to the size of plant facilities, desirable location on site, and plant access based on topography. If the power plant is part of an overall complex, the grading and drainage will be compatible and integrated with the rest of the complex. To minimize cut and fill, plant facilities will be located on high ground and storm water drainage will be directed away from the plant. Assuming on site soils are suitable, grading should be based on balanced cut and fill volume to avoid hauling of excess fill material to offsite disposal and replacement with expensive new material.

2) **Drainage.** Storm water drainage will be evaluated based on rainfall intensities, runoff characteristics of soil, facilities for receiving storm water discharge, and local regulations. Storm water drains or systems will not be integrated with sanitary drains and other contaminated water drainage systems.

3) **Erosion prevention.** All graded areas will be stabilized to control erosion by designing shallow slopes to the greatest extent possible and by means of soil stabilization such as seeding, sod, stone, rip-rap and retaining walls.

4) **Roadways.**
   a) **Basic roadway requirements**. Layout of plant roadways will be based on volume and type of traffic, speed, and traffic patterns. Type of traffic or vehicle functions for power plants can be categorized as follows:

- Passenger cars for plant personnel;
- Passenger cars for visitors;
- Trucks for maintenance material deliveries;
- Trucks for fuel supply; and
- Trucks for removal of ash, sludge and other waste materials.

b) **Roadway material and width.** Aside from temporary construction roads, the last two categories described above will govern most roadway design, particularly if the plant is coal fired. Roadway material and thickness will be based on economic evaluations of feasible alternatives. Vehicular parking for plant personnel and visitors will be located in areas that will not interfere with the safe operation of the plant. Turning radii will be adequate to handle all vehicle categories. Refer to TM 5-803-5/ NAVPAC P-960/AFM 88-43; TM 5-818-2/ AFM 88-6, Chap. 4; TM 5-822-2/AFM 88-7, Chap.7; TM 5-822-4/AFM 88-7, Chap. 4; TM 5-822 -5/AFM 88-7, Chap. 3; TM 5-822-6/AFM 88-7, Chap. 1; TM 5-822-7/AFM 88-6, Chap. 8; and TM 5-822-8.

c) **Railroads.** If a railroad spur is selected to handle fuel supplies and material and equipment deliveries during construction or plant expansion, the design will be in accordance with American Railway Engineering Association standards. If coal is the fuel, spur layout will accommodate coal-handling facilities including a storage track for empty cars or by using convey belt from coal mine site to power plant site depending on the distance. If liquid fuel is to be handled, unloading pumps and steam connections for tank car heaters may be required in frigid climates.

1.2.1.4 Economic considerations

Where the choice of several sites exists, the final selection will be based on economic and engineering considerations and studies.

1.2.2 CIVIL FACILITIES DESIGN AND CONSTRUCTION

1.2.2.1 Safety

The safety design features of the facility described in the following paragraphs will be incorporated into the power plant design to assist in maintaining a high level of personnel safety and security.

Design safety and security features

In designing a power plant, the following general recommendations on safety will be given attention:

1) Equipment will be arranged with adequate access space for operation and for maintenance. Wherever possible, auxiliary equipment will be arranged for maintenance handling by the main Steam Turbine Hall Crane. Where this is not feasible, monorails, wheeled trucks, or portable A-frames should be provided if disassembly of heavy pieces is required for maintenance.

2) Safety guards will be provided on moving parts of all equipment.

3) All valves, specialties, and devices needing manipulation by operators will be accessible without ladders, and preferably without using chain wheels. This can be achieved by careful piping design, but some access platforms or remote mechanical operators may be necessary.

4) Impact type handwheels will be used for high-pressure valves and all large valves.

5) Valve centres will be mounted approximately **7 ft (2.134 m)** above floors and platforms so that rising stems and bottom rims of handwheels will not be a hazard.

6) Stairs with conventional riser-tread proportions will be used. Vertical ladders, installed only as a last resort, must have a safety cage if required by the Occupational Safety and Health Act (OSHA).

7) All floors, gratings and checkered plates will have non-slip surfaces.

8) No platform or walkway will be less than **3 ft (0.914 m)** wide.

9) Toe plates, fitted closely to the edge of all floor openings, platforms and stairways, will be provided in all cases.

10) Adequate piping and equipment drains to waste will be provided.

11) All floors subject to washdown or leaks will be sloped to floor drains.

12) All areas subject to lube oil or chemical spills will be provided with curbs and drains.

13) If plant is of semi-outdoor or outdoor construction in a climate subject to freezing weather, weather protection will be provided for critical operating and maintenance areas such as the firing aisle, boiler steam drum ends and soot blower locations.

14) Adequate illumination will be provided throughout the plant. Illumination will comply with requirements of the Illuminating Engineers Society (IES) Lighting Handbook, as implemented by DOD 4270.1-M.

15) Comfort air conditioning will be provided throughout control rooms, laboratories, offices and similar spaces where operating and maintenance personnel spend considerable time.

16) Mechanical supply and exhaust ventilation will be provided for all of the power plant equipment areas to alleviate operator fatigue and prevent accumulation of fumes and dust. Supply will be ducted to direct air to the lowest level of the power plant and to areas with large heat release such as the turbine or engine room and the boiler feed pump area. Evaporative cooling will be considered in low humidity areas. Ventilation air will be filtered and heated in the winter also, system air flow capacity should be capable of being reduced in the winter. Battery room will have

separate exhaust fans to remove hydrogen emitted by batteries as covered in TM 5-811-2/AFM 88-9, Chap. 2.

17) Noise level will be reduced to at least the recommended maximum levels of OSHA. Use of fan silencers, compressor silencers, mufflers on internal combustion engines, and acoustical material is required as discussed in TM 5-805-4/AFM 88-37/NAVFAC DM-3.1O and TM 5-805-9/AFM 88-20/NAVFAC DM-3.14. Consideration should be given to locating forced draft fans in acoustically treated fan rooms since they are usually the largest noise source in a power plant. Control valves will be designed to limit noise emissions.

18) A central vacuum cleaning system should be considered to permit easy maintenance of plant.

19) Colour schemes will be psychologically restful except where danger must be highlighted with special bright primary colours.

20) Each equipment item will be clearly labelled in block letters identifying it both by equipment item number and name. A complete, coordinated system of pipe markers will be used for identification of each separate cycle and power plant service system. All switches, controls, and devices on all control panels will be labelled using the identical names shown on equipment or remote devices being controlled.

1.2.2.2 Size and arrangement of the civil facilities

Main building size and arrangement depend on the selected plant equipment and facilities including whether Steam Turbines (STs) are indoor or outdoor type; source of cooling water supply relative to the plant; the relationship of the switchyard to the plant; provisions for future expansion; and aesthetic and environmental considerations. Generally, the main building will consist of a Steam Turbines Bay with traveling crane; an auxiliary bay for feedwater heaters, Condensers, pumps, and switchgear; (or firing aisle for semi-outdoor units); and general spaces as may be required for machine shop, locker room, laboratory and office facilities. The general spaces will be located in an area that will not interfere with future plant expansion and isolated from main plant facilities to control noise. For very mild climates the turbine generator sets and steam generators may be outdoor type (in a weather protected, walk-in enclosure) although this arrangement presents special maintenance problems.

Architectural treatment.

The basic requirements are considered as follow:

a) The architectural treatment will be developed to harmonize with the site conditions, both natural and manmade. Depending on location, the environmental compatibility y may be the determining factor. In other cases the climate or user preference, tempered with aesthetic and economic factors, will dictate architectural treatment. Climate is a controlling factor in whether or not a total or partial closure

is selected. Semi-outdoor construction with the bulk of the steam generator not enclosed in a boiler room is an acceptable design.

b) For special circumstances, such as areas where extended periods of very high humidity, frequently combined with desert conditions giving rise to heavy dust and sand blasting action, indoor construction with pressurized ventilation will be required not only for the main building but also, generally, for the switchyard.

c) Control rooms (located close to the Steam Turbine Hall), offices, locker rooms, and some outbuildings will be enclosed regardless of enclosure selected for main building. Circulating water pumps may be installed in the open, except in the most severe climates. For semi-outdoor or outdoor stations, enclosures for switchgear and motor controls for the auxiliary power system will be enclosed in manufacturer supplied walk-in metal housings or site fabricated closures.

Structural design.

a) **Building framing and turbine pedestals**. Thermal stations will be designed utilizing conventional structural steel for the main power station building and support of boiler. The pedestal for supporting the turbine generator (and turbine driven boiler feed pump if utilized) will be of reinforced concrete. Reinforced concrete on masonry construction may be used for the building framing *(not* for boiler framing); special concrete inserts or other provision must be made in such event for support of piping, trays and conduits. An economic evaluation will be made of these alternatives.

b) **Exterior walls.** The exterior walls of most thermal power stations are constructed of insulated metal panels. However, concrete blocks, bricks, or other material may be used depending on the aesthetics and economics of the design.

c) **Interior walls.** Concrete masonry blocks will be used for interior walls; however, some specialized areas, such as for the control room enclosure and for offices, may utilize factory fabricated metal walls, fixed or moveable according to the application.

d) **Roof decks.** Main building roof decks will be constructed of reinforced concrete or ribbed metal deck with built-up multiply roofing to provide waterproofing. Roofs will be sloped a minimum of 1/4 inch per foot for drainage.

e) **Floors.** Except where grating or checkered plate is required for access or ventilation, all floors will be designed for reinforced concrete with a non-slip finish.

f) **Live loads.** Buildings, structures and all portions thereof will be designed and constructed to support all live and dead loads without exceeding the allowable stresses of the selected materials in the structural members and connections. Typical live loads for power plant floors are as follows:
- Turbine generator floor 23940.13Pa (500 psf);
- Basement and operating floors except turbine generator floor;
- Mezzanine, deaerator, and miscellaneous operating floors; and

- Offices, laboratories, instrument shops, and other lightly loaded areas Live loads for actual design will be carefully reviewed for any special conditions and actual loads applicable.

g) **Other loads.** In addition to the live and dead loads, the following loadings will be provided for:
   - **Wind loading.** Building will be designed to resist the horizontal wind pressure available for the site on all surfaces exposed to the wind.
   - **Seismic loading.** Buildings and other structures will be designed to resist seismic loading in accordance with the zone in which the building is located.
   - **Equipment loading.** Equipment loads are furnished by the various manufacturers of each equipment item. In addition to equipment dead loads, impact loads, short circuit forces for generators, and other pertinent special loads prescribed by the equipment function or requirements will be included.

Foundation design

a) Foundations will be designed to safely support all structures, considering type of foundation and allowable bearing pressures. The two most *com*mon types of foundations are spread footings and pile type foundations, although “raft” type of other special approaches may be utilized for unusual circumstances.

b) Pile type foundations require reinforced concrete pile caps and a system of reinforced concrete beams to tie the caps together. Pile load capabilities may be developed either in friction or point bearing. The allowable load on piles will be determined by an approved formula or by a load test. Piles can be timber, concrete, rolled structural steel shape, steel pipe, or steel pipe concrete filled.

c) Design of the reinforced concrete turbine generator or diesel set foundation, both mat and pedestal, will be such that the foundation is isolated from the main building foundations and structures by expansion joint material placed around its perimeter. The design will also ensure that the resonance of the foundation at operating speed is avoided in order to prevent cracking of the foundation and damage to machines caused by resonant vibration. The foundation will be designed on the basis of deflection. The limits of deflection will be selected to avoid values of natural frequency by at least 30% above or 30% below operating speed.

d) Vibration mounts or “floating floor” foundations where equipment or equipment foundation inertia blocks are separated from the main building floor by springs or pre-compressed material will generally not be used in power plants except for ventilation fans and other building service equipment. In these circumstances where such inertia blocks are considered necessary for equipment not normally so mounted, written justification will be included in the project design analysis supporting such a necessity. The location of turbine generators, diesel engine sets, boiler feed pumps, draft fans, compressors, and other high speed rotating equipment on elevated floors will be avoided because of the difficulty or impossibility of isolating equipment foundations from the building structure.

1.2.2.3 The project main civil facilities

Fig. 1.7 – Plant Panoramic Front View

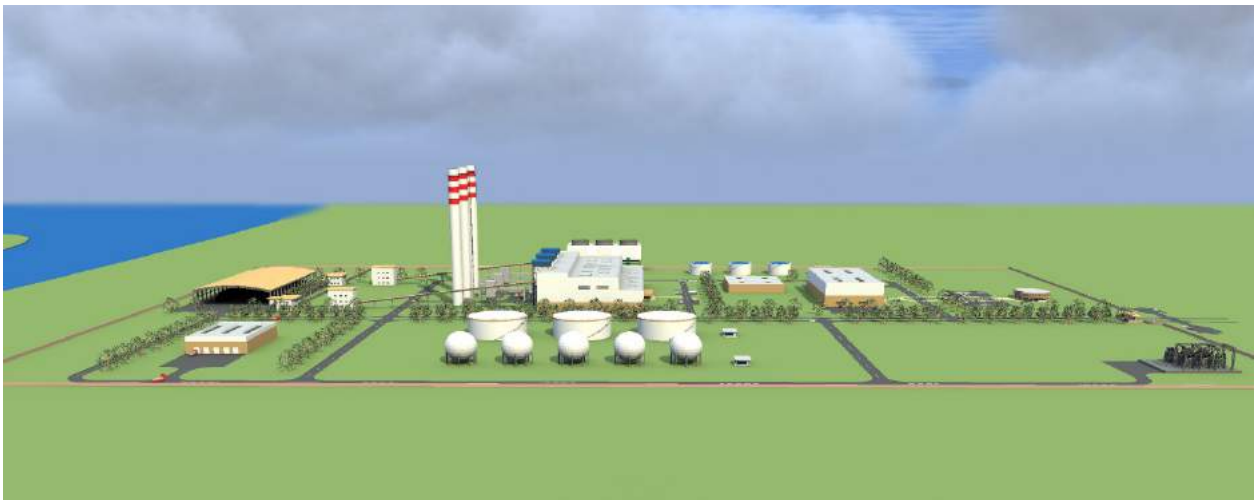

Fig. 1.8 – Plant Panoramic Right View

Fig. 1.9 – Plant Panoramic Left View

The main Civil Facilities (CFs) consist of followings (Fig. 1-10 below):

1) CF1 – Access roads external and internal roads)
2) CF2 – Main entrance and security post
3) CF3 – Administration and operations management building
4) CF4 – Coal receiving, storage and handling facilities
5) CF5 – Storeroom and maintenance workshop
6) CF6 – Wastewater treatment plant
7) CF7 – Powerhouse
8) CF8 – Stacks / Exhaust ducts
9) CF9 – 1 x raw water tank and 2 x clean water storage tanks (concrete)
10) CF10 – 3 x cooling water tanks
11) CF11 – Gas supply tanks
12) CF12 – Power generation and distribution control room
13) CF13 – Coal gasifier

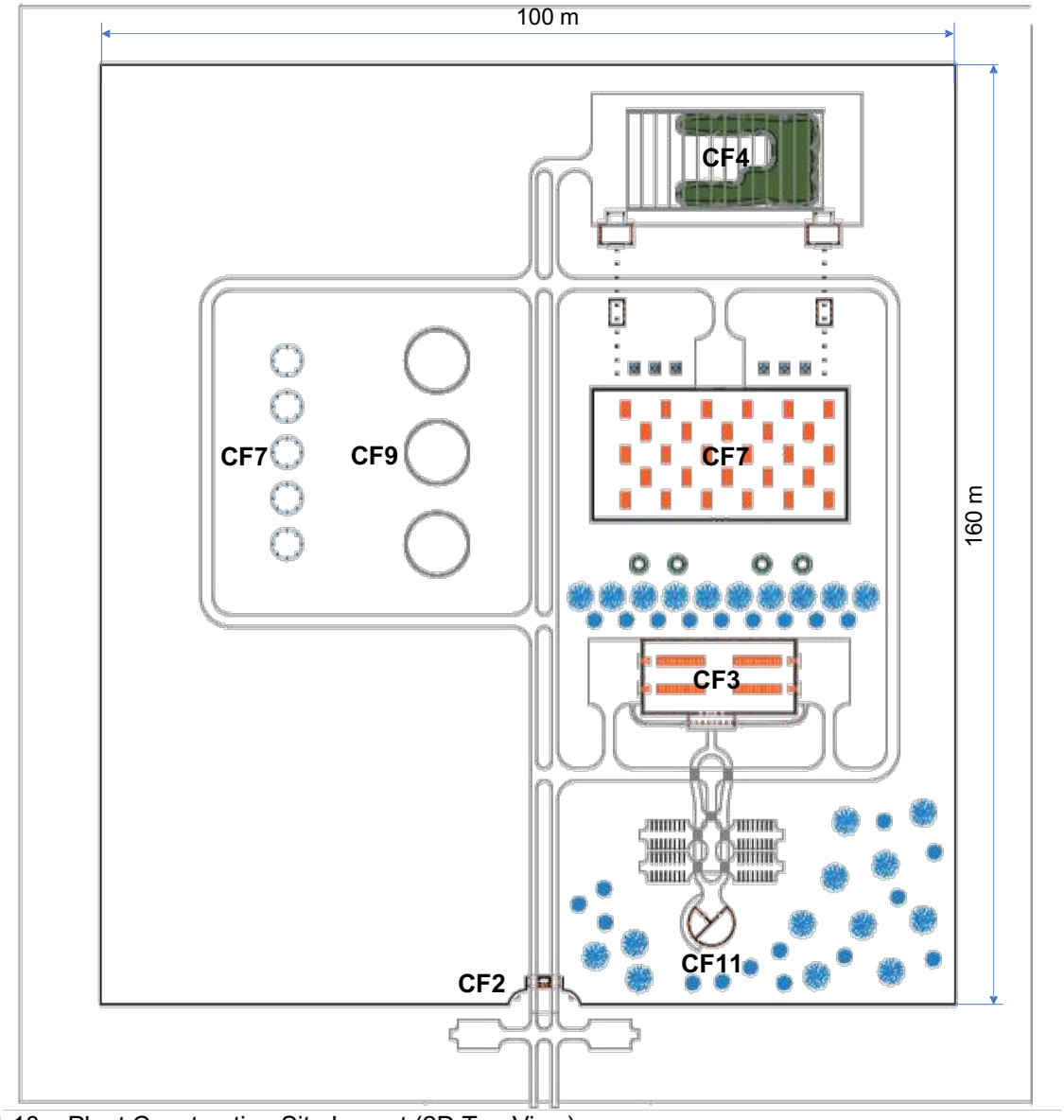

Fig. 1.10 – Plant Construction Site Layout (2D Top View)

CF1 – Access roads (external and internal roads)

The Power Plant shall be provided with high quality standard internal roads, which shall be designed for heavy-duty equipment and the transportation of heavy technologies up to 100 tons.

The external and internal access of the plant shall be provided in accordance with the international system of roadways, consisting of three types of roads: Type I, Type II and Type III, provided as follow:

1) **Type I roads** shall consist of one **10.0 m** wide asphalt paved carriageways with 1.5 m wide hard shoulders. The main plant access roads of a two-lane roads (entrance and exit) and a portion of the main plant complex circumferential road shall be Type I.

2) **Type II roads** shall be **4.5 m** wide with **1.5 m** wide hard shoulders on either side.

3) **Type III roads** shall be provided along the plant boundary for access for security and maintenance.

All roads shall be surfaced with gravel during the construction period. Occasional applications of a dust palliative material shall be used to minimize the dust problem during the dry seasons.

All Type I and Type II roads shall have a minimum turning radius of **15.2 m**. Bollards shall be provided alongside all type roadways near equipment which requires protection. Spare duct banks shall be provided under all type roads spaced at **100 m** intervals.

CF2 – Main entrance and security post

As provided in Figures 1.7 to 1.10, the Main Entrance Security Post has One (1) main section, called the Main or Central Security Post of the Power Plant of the following dimensions: **12 m x 5 m x 12 m (60 m^2)**. The security post shall be provided with its own locker room located at the first floor. The security shall be responsible for the surveillance and security of the whole power plant and its surroundings, including parking areas. Visitors' cars are not allowed to enter the premisses of the plant. Visitor's Parking areas are located just at the main gate and very close to the security post to enable a regular registry and strict control of the visitors. The central security post shall be provided with modern monitoring systems capable of detecting radioactive and toxic materials of the supplied coal. All the lorries or trucks and theirs content shall be weighted and screened at the main entrance before and before they are allowed to enter the plant.

The security post shall also be provided with:

- One (1) advanced CCTV, monitoring all the premisses and the plant surroundings. The main security post shall have a CCTV of LG ultrawide monitor (LG 49WL95C) provided with loads of connectivity, a super-high resolution, and HDR.

- Two (2) closets, Two (2) steel tables and with drawers and two office chairs,

- Its own locker room for all the security guaranty guards on duty. The locker room shall be located on the upper floor with toilets. The lower or ground floor or operation office shall be provided with a small semi-detached eatery **(4 m x 4 m)** for coffee, tea breaks and supper.

CF3 – Administration and operations management building

The Administration Building and Operations Management Building (**25 m x 20 m x 12 m**) is a modern complex provided with the followings:

- **Building reception:** at the ground floor provided with reception desk, waiting rooms and TV, showing the plant activities, including daily and historical productions information and data.

- **First Floor:** Six (6) offices, One (1) Rest Room and One (1) Kitchen.

- **Second Floor:** Four (4) offices, One (1) Conference Room and One (1) visitors' Rest Room.

CF4 – Coal receiving, storage and handling facilities

Coal receiving and storage area

Four underground coal hoppers are set to receive coal from the covered coal area. The hopper is reversed pyramidal shape. Under the outlets of hopper, four GK type-vibrating feeders will be installed. The dimensions of the Coal Storage Area are **35 m x 26 m x 15 m**. Its area is **910 m^2**. This Storage Facility is a capacity of storing a minimum quantity of **9,500 MT** of coal, which represent a storage capacity of cca. **40 days**.

Crushing facility

Crushing facility is located in the belt conveying system. One stage crusher is used for the plant. Two crushing plant will be provided for coal processing, one operating, one standby, and the possibility for operating simultaneous will be considered.

The oversized coal will go to the crusher to be crushed into the required size of coal boilers. The capacity of coal crusher **of an adjustable capacity of 30-40 t/h** for a **Gasifier of a capacity of 25-30 t/h**. The crushed coal supply to the Gasifier is directly supplied from

The Total capacity of the crushing and silo filling system for the Three Units is determined on the basis of the daily maximum burn rate for the Three Units times approximately **2.4.** This ***service factor*** allows for maintenance and flexibility of operation, requiring approximately 10 hrs. per day to supply the units with 24/7 worth Coal. The conveyor path usual shall consist of dual conveyors with each conveyor handling half of the total capacity (1.2 time maximum gasification rate). The use of dual units securer full capacity, even with one (1) conveyor out of service for maintenance or repair.

The total average gasification rate of **27.90** tons per hour (tph) will have the following silo filling system. The system will handle:

- 27.5 tph x 1.2 = **33 tph** (for filling system from the silo of the crushed coal);

Belt conveying system

The Bet Conveying System shall be provided with a standby to back up the coal supply to Gasifier and secure the coal reclaim system.

Plough strippers will be used on the gasifier bunker to unload coal from the belt conveyor to the gasifier bunker.

Block separator

One Block Separator will be installed in the **No.1 transfer tower**.

The Plant is provided with a Block Separator to protect the coal handling system from damage by any extraneous material delivered in the coal, including wood logs, bricks, large metal items and other contaminants.

CF5 – Storeroom and maintenance workshop

The Power Plant Storeroom and Maintenance Workshop shall be located in the same Building (CF5), separated by a Glass Wall.

Storeroom

The Storeroom is the room in which the spare parts, accessory technologies and equipment are stored. The storeroom shall be kept under required temperature and standard, preventing the contact of the aforementioned items with dust. The dimensions of the storeroom are **30 m x 25 m x 12 m**. Delivery Trucks can directly get access in the store as shown in Figure 1-5 above.

Maintenance workshop

The Maintenance Workshop of the power plant shall be provided with the area of **300 m^2 (30 m x 10 m x 12 m)** and an asphalted outdoor area of **800 m^2**, where heavy-duty and large-sized equipment are temporary kept (i.e. at the backside of the Storeroom). All the working tools requirement for the maintenance of the plant equipment are kept in the workshop.

CF6 – Wastewater treatment plant

Besides, the raw water collected or piped directly from Oji river, the onsite water treatment facility treats all runoff, cleaning wastes, blowdown, and backwash to within the International and Nigerian EPA standards for suspended solids, oil and grease, pH, and miscellaneous metals. Waste treatment equipment is housed in a separate semi-detached building to the **Powerhouse**. Its total Product Capacity is **100 m^3/hr**. The waste

treatment system consists of a water collection basin, three raw waste pumps, an acid neutralization system, an oxidation system, flocculation, clarification/thickening, and sludge dewatering. The water collection basin is a synthetic-membrane-lined earthen basin, which collects rainfall runoff, maintenance cleaning wastes, and backwash flows.

The raw waste is pumped to the treatment system at a controlled rate by the raw waste pumps. The neutralization system neutralizes the acidic wastewater with hydrated lime in a two-stage system, consisting of a lime storage silo/lime slurry makeup system, dry lime feeder, lime slurry tank, slurry tank mixer, and lime slurry feed pumps.

The oxidation system consists of an air compressor, which injects air through a sparger pipe into the second-stage neutralization tank. The flocculation tank is fiberglass with a variable speed agitator. A polymer dilution and feed system is also provided for flocculation. The clarifier is a plate-type, with the sludge pumped to the dewatering system. The sludge is dewatered in filter presses and disposed offsite. Trucking and disposal costs are included in the cost estimate. The filtrate from the sludge dewatering is returned to the raw waste sump.

CF7 – Powerhouse

The Powerhouse shall contain all the power generating technologies and equipment in its area of **980 m^2** (**35 m x 28 m x 12.00 m**). The distance between the Powerhouse walls and Gensets and Steam Turbine, installed side by side, shall be **5 m** in order to ease the movement of large and heavy equipment and people during scheduled, unscheduled and periodic maintenances. For the same purpose, the distance, the distance between Gensets and Turbine shall also be **5 m**. The main components and equipment of the powerhouse are:

- Gensets
- Steam Turbine
- Generator
- Powerhouse Crane
- Cooling Water Pump
- Technical Team Office
- Control Room

CF8 – Stacks / Exhaust ducts

The Plant can be provided with one (1) stack with a single fiberglass-reinforced plastic (FRP) liner instead of three (3) as provided in Figures 1.7, 1.8, 1.9 and 1.10 above. The stack is constructed of reinforced concrete. The stack is **152 m (500 ft)** high for adequate particulate dispersion.

CF9 – 1 x raw and 2 x clean water storage tanks (concrete)

The Power plant has three (3) concrete water tanks WT1, WT2, and WT3. WT1 is the raw water tank while WT2 and WT3 are the clean water tanks, which shall be used for the gasification, cooling, consumption and other usages within the plant. The standard dimensions of the Tanks are provided in the table 1-9 below. WT2 shall be used for

potable water supply to the power plant, and extra water shall be supplied to the distribution system of the Free Trade Zone. WT3 is used to store the water required for the gasification.

Table 1-9: Standard Dimensions of the Water Tanks

Tank Capacity [L]	Tank Capacity [Gal]	External Diameter [m]	External Height [m]	Site Hole/Diameter [m]
4,000,000	1,056,688	30.5	6.0	33.0

The clean water storage capacity of the is **8,000 m^3** and the raw water storage capacity is **4,000 m^3**. This Quantity is enough for the sustainable operation of the plant 24/7. The power plant also may sell child potable water to the all the free trade companies and generated extra incomes. **The potable water by is also a by-product of the power plant**.

NOTE:

- *Tank Height includes a **350mm Riser** on top.*
- *Heights include a standard roof. Heavier roofs increase the height*
- *Measurements above are an external measurement*

CF11 – 3 x cooling water tanks

The cooling water shall be treated to meet the following quality specifications as provided in table 1-10 below.

Table 1-10: Cooling water / coolant for the cooling circuit

Parameters	Value
pH value at 25 °C	9 to 10.5
Electrical conductivity	less than 0.1 mS/cm
Oxygen (O_2)	less than 0.05 mg/L
Chloride	less than 20 mg/L
Copper (Cu)	less than 0.05 mg/L
Total iron (Fe)	less than 0.05 mg/L
Earth alkalis	5 to 10 mg/L
Total hardness	less than 0.02 mmol/L

Cooling technologies

One of the main inputs for the 10 MWh IGCC power plant is water, which is used for the gasification and for cooling the power plant and for consumption in order to keep the power plant operating sustainably. As a thermoelectric plant, the cooling system of this power plant withdraws water and evaporate it to condense the steam back to a liquid for pumping and efficiency purposes.

There are two widely implemented types and one seldom used type of cooling for power production. The **two major types** are **once-through cooling** and **closed-loop cooling**; the **minor type** is termed **dry cooling**. Dry cooling is typically more water efficient, both from a capital cost and an operational cost because **dry cooling** uses **little** or **no water** and needs less maintenance than cooling towers that require water. **Dry cooling will not be considered in the design of the cooling system of this power plant**.

Once-Through Cooling

Once-through cooling systems use the nearby water to help cool the condenser water. The **river** or **lake water** is passed through a heat exchanger to condense the steam. The exiting condenser water is pumped back through the cycle and the river water is returned to the stream (Figure 1.11). The water consumption at the power plant is minimal, if not zero, because the water does not directly contact the air. However, the temperature increase of the river water increases the evaporation rate, thus indirectly increasing the amount of water consumption. Although the consumptive water use is minimal, the amount of water withdrawn from the river is significant because the water is only used for a short time before it is returned to the stream.

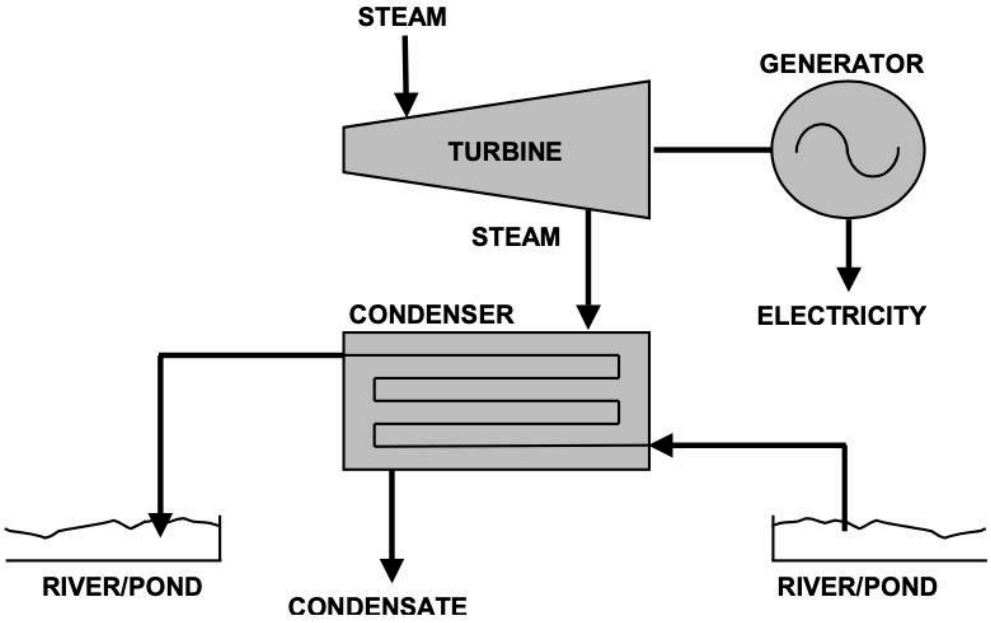

Fig. 1.11 – Once-trough cooling system

If the plant has a once through cooling system, the following will be determined:

1) The limitations established by the appropriate regulatory bodies, which must be met to obtain a permit required to discharge heated water to the source.

2) Maximum allowable temperature rises permissible as compared to system design parameters. If system design temperature rise exceeds permissible rise, a supplemental cooling system (cooling tower or spray pond) must be incorporated into the design.

3) Maximum allowable temperature for river or lake after mixing of cooling system effluent with source. If mixed temperature is higher than allowable temperature, a supplemental cooling system must be added. It is possible to meet the conditions of point 2. above and not meet the conditions in this subparagraph.

4) If extensive or repetitive dredging of waterway will be necessary for plant operations.

5) The historical maximum and minimum water level and flow readings. Check to see that adequate water supply is available at minimum flow and if site will flood at high level.

Closed-Loop Cooling

A closed-loop cooling system was designed to minimize the amount of water withdrawn from the river. In this system, the condenser water still exchanges heat with water in a heat exchanger, but the cooling water is recycled between a cooling tower and a heat exchanger (Figure 1.12). In this system, the cooling water is cooled by evaporating a percentage of the water to the environment. Because the water is evaporated, there has to be a make-up water supply to account for the consumed water. The make-up water typically comes from the nearby water source. This system consumes much more water than once-through types because the entire energy exchange is through evaporation of the water (a consumptive use). These systems withdraw less water because the only water used is to make up the evaporated portion; however, they consume more water.

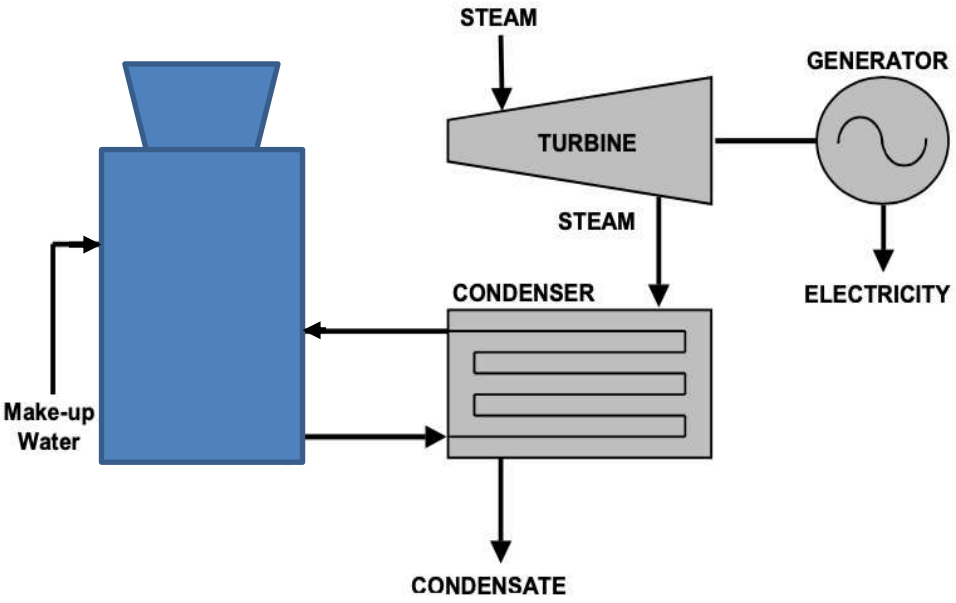

Fig. 1.12 – Closed-loop cooling system

CF12 – Gas Storage Tanks

The Five (5) Gas Storage Tanks (GST1, GST2, GST3, GST4, and GST5) are required for the storage of the Syngas generated from Gasifiers. Each Genset has its own Gas Supply Tanks (GST1 and GST2). The other three (3) Gas Storage Tanks contain the reserved Syngas continually generated from the Gasifier in the case of scheduled and unscheduled maintenance of the Gasifier or coal or water outages. The reserved quantity of gas in one tank is enough the keep the Genset of 3.333 MWh running for at least five (5) without fuel supply. Hence, the total reserve can keep keep the power plant running for a period of at 14 days (2 weeks). The internal radius of the tanks is **8.95 m**.

The standard dimensions of the Gas Storage Tanks are provided in the table 1-11 below.

Table 1-11: Standard Dimensions of the Gas Storage Tanks

Parameters	Unit /Standard	Value
Capacity	m^3	3,000
Weight	kg	636,868
Full Load Weight	T	2,330
Outer Material	SA-537M Cl.2	-
Inner Material	SA-537M Cl.2	-
Maximum Working Pressure	MPa	1.8
Working Temperature	°C	-34 to 40
Design Temperature	°C	-20 to 50
Standard	ASME BV	-
Colour	White	-
Hydraulic test	MPa	2,484
Air tightness test	MPa	1,737

CF13 – Power Generation and Distribution Control Room

The Control Room is designed to monitor the generation and distribution capacities of the Power Plant, assuring that all the equipment, Genset, Turbine, Generator, Gasifier, Coal handling equipment and storage facilities, etc. are operating perfection without defect. All the power plant operation data, including emission limits data are monitoring and adjusted from the from control room. Any other detected mechanical or electric fault shall be announced to the technical team to fix it on site and without delay.

The Control Room, as shown in Figure 1.11 above, is in circular shape with a radius of 6.5 m. Its area is **132.70 m²**. The Control Room Manager is responsible for the billing data in cooperation with the Financial Department. All the plant operation data history shall be kept in the Control Room.

CF14 – Coal gasifier

In a gasifier, coal undergoes a series of chemical and physical changes as shown in Figure 1-13. Each of the steps is described in more detail below. As the coal is heated most of the moisture is driven out when the particle temperature is ~ 105ºC. Drying is a rapid process and can be essentially complete when the temperature reaches ~ 300ºC (1) depending on the type of coal and heating method used.

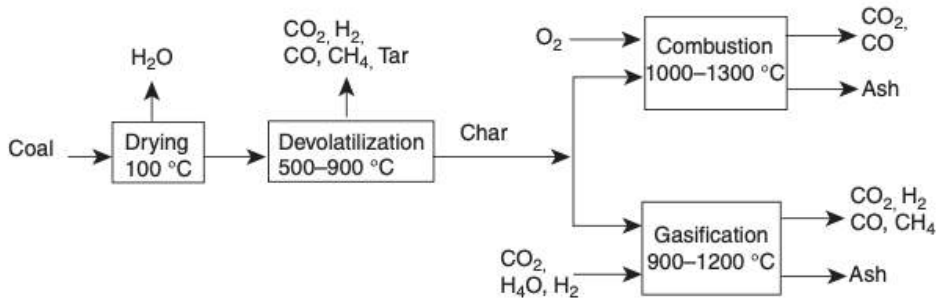

Fig. 1.13 – Chemical and physical changes of coal

Coal gasification is the process of reacting coal with oxygen, steam, and carbon dioxide to form a product gas containing hydrogen and carbon monoxide. Gasification is essentially incomplete combustion. The chemical and physical processes are quite

similar; the main difference being the nature of the final products. From a processing point of view the main operating difference is that gasification consumes heat evolved during combustion. Under the reducing environment of gasification the sulphur in the coal is released as hydrogen sulphide rather than sulphur dioxide and the coal's nitrogen is converted mostly to ammonia rather than nitrogen oxides. These reduced forms of sulphur and nitrogen are easily isolated, captured, and utilized, and thus gasification is a clean coal technology with better environmental performance than coal combustion.

Depending on the type of gasifier and the operating conditions gasification can be used to produce a fuel gas suitable for any number of applications. A low heating value fuel gas is produced from an air blown gasifier for use as an industrial fuel and for power production. A medium heating value fuel gas is produced from enriched oxygen blown gasification for use as a synthesis gas in the production of chemicals such as ammonia, methanol, and transportation fuels. A high heating value gas can be produced from shifting the medium heating value product gas over catalysts to produce a substitute or synthetic natural gas (SNG).

Coal gasification is presented by first describing the chemistry of the process and the coal characteristics that affect the processes. Coal gasification processes have been tailored to adapt to the different types of coal feedstocks available. The development of gasification is then presented from an historical perspective. This leads into the discussion of the types of gasifiers most commonly used and the process improvements made to meet the changing market needs. Complete gasification systems are then described including typical system configuration, required system attributes, and environmental performance. The current status, economics of gasification technology, and future of gasification are also discussed.

1.2.2.4 Miscellaneous system description

Magnetic separators

Two (2) sets of belt magnetic separators shall be installed in the belt conveying system. These belt magnetic separators will be of self-cleaning, suspended type, and arranged on the head part of the on the Convey Belts CV1, CV2, CV3 and CV4.

Coal sampling system and belt scales

Two (2) sets of Fired Sampling facility and Belt Scales will be installed in the middle of each of the Conveyor Belts.

The Convey Belts will also be provided with Sampling System to monitor the coal characteristic and it will be equipped with coal returning device.

Electronic Belt Scales will be used with test weight required for accurate calibration.

1.2.2.5 Syngas cleaning system

- **Carbon dioxide capture, storage and utilisation unit**

Coal is more **abundant and cheaper than oil and natural gas**, but it exhausts high carbon dioxide gas (CO_2) and sulphur content of the environment load at the time of the use.

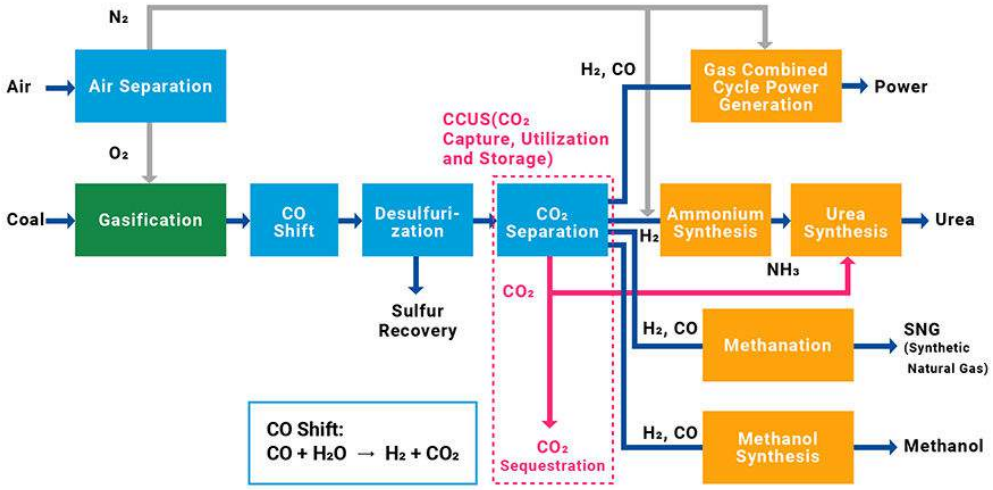

Fig. 1.14 – CO_2 Capture, Storage and Utilisation Unit

Clean Coal Technology (CCT), which uses coal in high efficiency and clean, is a key technology to reduce the discharge of the material having high environmental load.

Especially since the coal gasification process provides higher energy efficiency in CCT, it is expected to be more widely used for a power generation and chemical raw material production.

Capabilities: Coal Gasification cleaning Technology main characteristics consist of maximizing coal use efficiency and minimizing environmental impact in various plants that use coal gasifier synthetic gases. Some of them are designed to suitably process and produce chemical raw materials from syngas produced by coal gasification.

- **Sulphur Recovery Unit (SRU)**

H_2S removed in the AGR process is sent to the sulphur recovery unit (SRU) as acid gas. SRU recovers H2S as elemental sulphur through the Claus reaction (see the attached figure). Reactions occur in two stages: the flame reaction stage and the catalytic reaction stage. The former consists of a high-performance burner, mixing chamber, and heat removing boiler, while the latter has two to three reactor stages. The sulphur recovery rate of the Claus process is about 95 to 97%. The tail gas that contains unrecovered sulphur is fed to the tail gas treating unit (TGT). The recovered sulphur is stored in the sulphur pit and shipped as product after undergoing a degassing process to remove H_2S. The Claus process is an

equilibrium process, and a modified version of it with direct oxidation catalysts stored in the final stage is called subERCLAUS. Since this improved process does not depend on Claus equilibrium, it can attain a 99% recovery ratio without TGT (Licensor: Jacobs Comprimo). It is important for the Claus process that appropriate burners be selected and use the right catalysts to ensure high recovery rate and long service life.

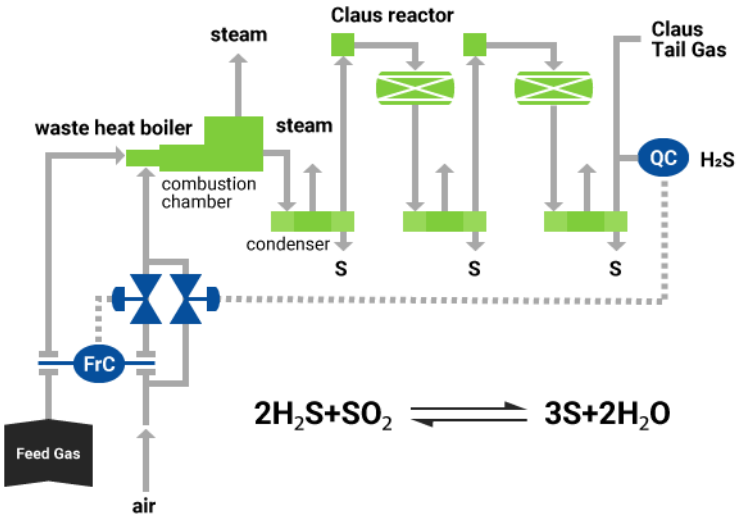

Fig. 1.15 – Sulphur (H_2S) Recovery Unit

Capabilities: By using TGT process, 99.2% recovery can be achieved.

1.2.2.6 Environmental considerations

All power plant design, regardless of the type of power plant, must be in accordance with the rules and regulations, which have been established by Federal, state and local governmental bodies.

To meet various environmental regulations, it is often necessary to utilize design features that will greatly increase the cost of the power plant without increasing its efficiency. For example, the cost of the pollution control equipment that will be required for each site under consideration is one such item, which must be carefully evaluated.

1.2.2.7 Water supply

General requirements

Water supply will be adequate to meet present and future plant requirements. The supply maybe available from a local municipal or privately owned system, or it may be necessary to utilize surface or subsurface sources.

Quality

Water quality and type of treatment required will be compatible with the type of power plant to be built. The quality of water requirement for a sustainable operation of the power plant and its facilities are provided in table 1-12 below.

Table 1-12: Daily input and output values from various IGCC plants

Parameter	Limit Value
WITHOUT EXHAUST HEAT EXCHANGER	
pH value at 25 °C	6.5 to 8.5
Chloride ion content	maximum 100 mg/L
Sulphate ion content	maximum 100 mg/L
Total hardness	3 to 12 °dH
Carbonate hardness proportion of the total hard- ness	minimum 3 °dH
WITH EXHAUST HEAT EXCHANGER	
pH value at 25 °C	6.5 to 8.5
Chloride ion content	maximum 100 mg/L
Sulphate ion content	maximum 100 mg/L
Total hardness	less than 1 °dH
Carbonate hardness proportion of the total hardness	less than 1 °dH
WITH EXHAUST HEAT EXCHANGER – Engine Cooling Circuit	
pH value at 25 °C	6.5 to 8.5
Chloride ion content	maximum 20 mg/L
Filling Volumes	maximum 2 m^3
Temperature at exhaust heat exchanger outlet	maximum 110 °C
COOLING WATER / COOLANT FOR THE COOLING CIRCUIT	
pH value at 25 °C	9 to 10.5
Electrical conductivity	less than 0.1 mS/cm
Oxygen (O_2)	less than 0.05 mg/L
Chloride	less than 20 mg/L
Copper (Cu)	less than 0.05 mg/L
Total iron (Fe)	less than 0.05 mg/L
Earth alkalis	5 to 10 mg/L
Total hardness	less than 0.02 mmol/L

Water rights

If water rights are required, it will be necessary to assure an agreement for permanent water rights for the supply of sufficient quantity for present and future use. But, based on our experiences, there is a huge water supply problem within the whole Nigeria. So, it absolutely not possible to secure a sustainable and satisfactory supply of quantity of water required by the power plant.

Water wells

If the makeup to the closed system is from water wells, a study to determine water table information and well drawdown will be required. If this information is not available, test well studies must be made. This proposal is not possible due to environmental concerns. Besides, the underground water is protected and reserved only for human consumption because as stated earlier, it is one of the cleanest waters in the world that can be directly consumed without additional treatment.

NOTE:
The only available possibility is to pipe raw water from Oji River and treat it in accordance with the requirement of the technologies and equipment of the plant and in table 1.7 above.

1.2.2.8 Fuel supply

Site selection will take into consideration fuel storage and the ingress and egress of fuel delivery equipment.

1.3 SOURCE OF FINANCING AND FINANCIAL MODELS

1.3.1 PROJECT ORGANIZATIONAL STRUCTURE

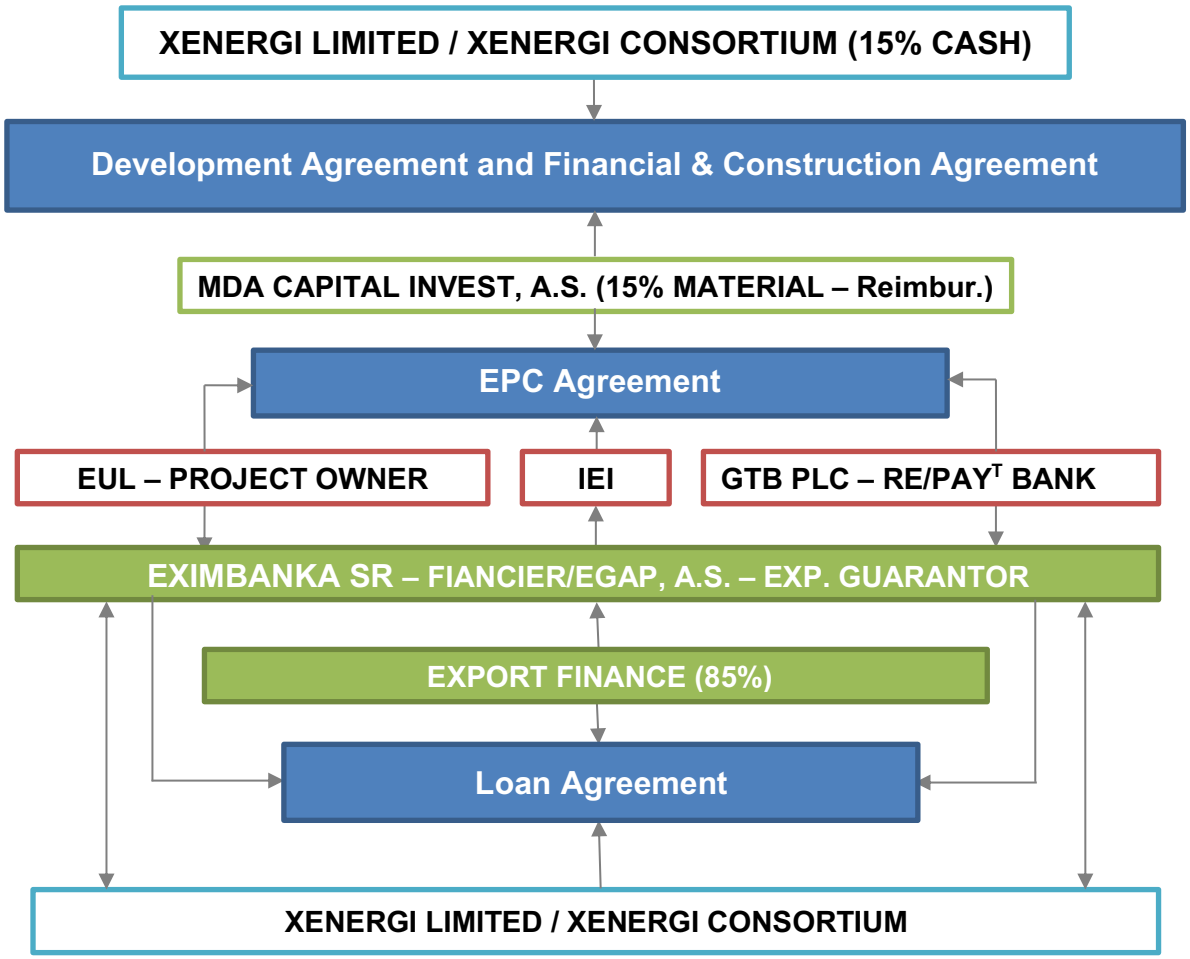

Fig. 1.16 – Project Organizational Structure

NOTES:

- *The EPC Contractor, ISTROENERGO INTERNATIONAL, A.S. (IEI), shall provide a Performance Bond (PB) of 2% (Two percent) maximum of the contract sum (EPCI Agreement) and guarantee the executed part of the Project or operation of installed technologies for a period of Two (2) pursuant to ICC Publication No. 458, INCOTERMS 2000. This condition shall be included in the EPCI Agreement.*

- *Concerning the local Contractors or Suppliers, an Advanced Payment Guarantee (APG) of the equivalence of the Total Mobilization Fee (TMF) shall be provided by their own appointed local banks. The terms and conditions of the returning back of the APG to Contractors or Suppliers shall be negotiation in the EPCI Agreement.*

1.3.2 FUNDING ARRANGEMENT

The realization of the project consists of the Development, EPC and Operations management.

It is always required by the Financier, the EXIMBANKA SR or any EU prime bank that the Project Owner, XENERGI LTD, shall provide the following documents. These documents constitute the major (98%) scope of works of the Project development, which shall be borne by the Project owner at his own cost.

a) Letter of Interest (LOI) from borrower seeking financing (*addressed to MDACI*);

b) Audited financial statements of the borrower for the last 3 years (management accounts in lieu of audited accounts for the current years);

c) A business plan or technoeconomic feasibility study for the underlying project, including the cash flow projections, underlying assumptions and repayment schedule;

d) Source of primary fuel from XENERGI LTD and/or Project own Coal mines.

e) Power Purchase Agreement (PPA) to be signed between the potential off-takers registered as a Free Zone Enterprise (FZE) in the EFTZ;

f) Details of Design and Build Contractor Engagement (i.e. EPC Agreement);

g) Details of Operation and Maintenance Contractor engagement;

h) Details of any Consultant/Adviser engagement;

i) The Project's financial model;

j) Certificate of Incorporations and VAT Registration Certificate;

k) Environmental Impact Assessment (EIA) report approved by the Federal Ministry of Environment (FMENV) or the relevant Nigerian Authority;

l) A sworn statement that the company is not in receivership or about to be in receivership;

m) A sworn Affidavit that the company is not a replacement for a hitherto tax defaulting company;

1.3.2.1 Implementation or construction financing

This section focuses on the Project implementation finance from local and foreign sources. Important aspects of this include the nature of raising capital and the associated cost or pricing aspects.

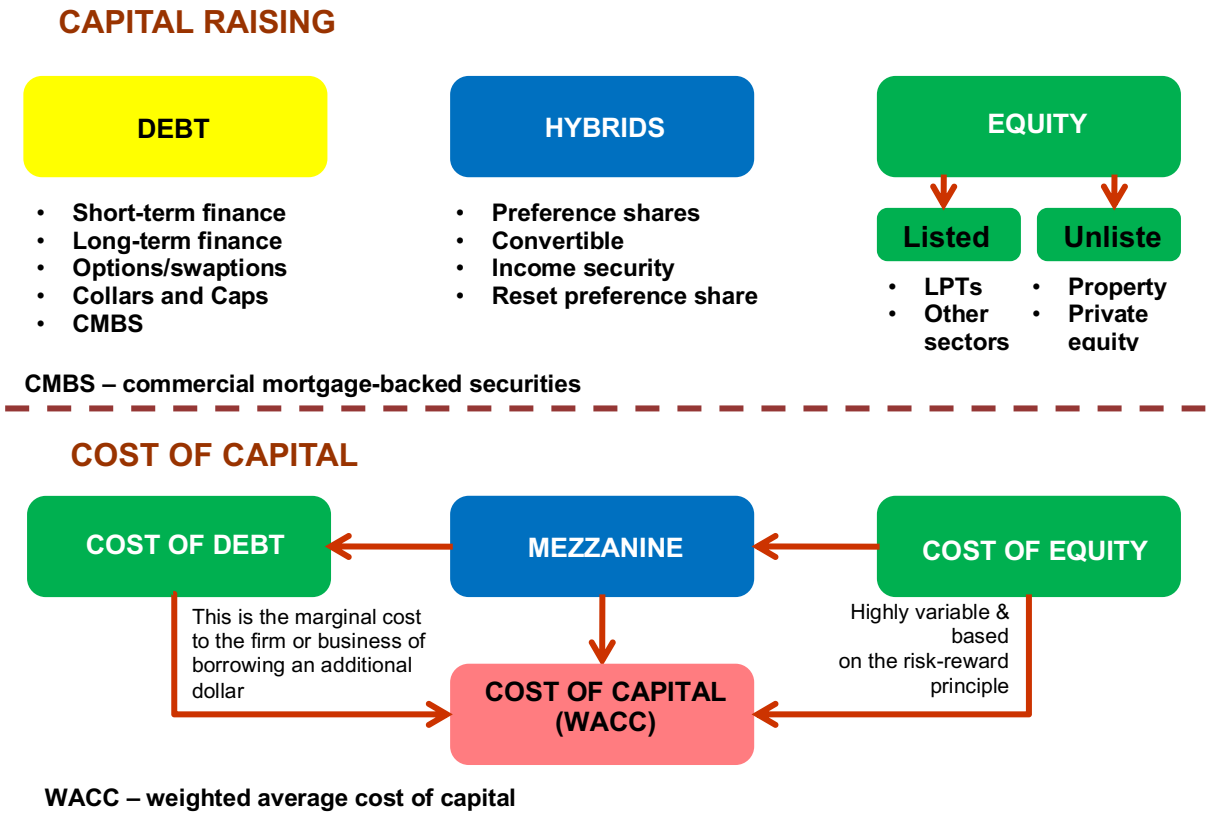

Fig. 1.17 – Financing structures and pricing

The Figure 1.17 above, shows that funding can be undertaken in three main ways: ***via debt, equity or a combination of the two; also referred to as mezzanine funding***. Decisions about the type of funding options necessarily take the cost of these funding options into account.

Types of implementation finance

There are many types of financing products available in the market, which are tailored towards the purpose of energy implementation project. For instance, financing can be used for site acquisition and/or carries pre-development risks, bridging purposes, construction activity and for fixed term investments. Accordingly, each of these carries with it different types of risks. For instance, financing for site acquisition and/or carries pre-development risks (which include planning, regulatory approvals); bridging finance carries funding risks (such as movements in interest rates); construction finance carries implementation risks (such as cost blow-outs, project delays, industrial relations, and expected rental income); and term investments carry market risks (which include changing space market fundamentals, leasing conditions and asset pricing (on completion). In all, when assessing risk, consideration needs to be given to the nature and purpose of the project, the type of security available, the credit status of the recipient, and forecasting analysis to assess payment prospects. Many debt financing arrangements consider some of the following key elements in structuring such packages. These elements include **debt service** or **Interest Cover Ratio** (ICR); the form of security (such as mortgage, cash deposit or guarantees); the **Loan-to-Value Ratio** (LVR) or

gearing level; and the return on capital. This information is used by the financier to assess five key issues the:

i) cash flow sustainability in terms of the quality of income stream, lease covenant or term;
ii) quality of the security (or collateral);
iii) quality or credit-rating of the borrower;
iv) conditions of the energy market; and
v) refinance risk.

In our case, the site acquisition and/or carries pre-development risks are not included in the realization of the aforementioned Project. The CBN Power Project financial scheme is design to cover the Project Construction (quality) and Management (efficiency) risks.

Providers of financial supports

In the national and international market, there are many providers of equity and debt funding. Providers of equity funding include private investors, partnerships / syndicates, unlisted ownership vehicles, World Bank, Millennium Development Goals (MDGs), Community Development Lenders, Certified Community Development Financial Institutes, Specialized Loan Funds, Small Deal funds, NGOs, etc. Debt funding mainly comes from banks.

For the purpose of the implementation of this 10MWh IGCC power project in the Enpower Free Trade Zone, the MDACI Financial Consortium (e.g. CEB, a.s. or EXIMBANKA SK, etc.) is ready, willing and able to provide 85% of the Total Investment Capital (TIC) or Total Project Cost (TPC) at a fixed Interest Rate (IR) of 5% per annum (p.a.) of the credit and reimbursable within a period of 5-10 years with a moratorium of 2 years, within which the EPC of the 10 MWh IGCC is scheduled. The basic Terms and Conditions provided of the Term-Sheet provided in **APPENDIX 5** of this PAM.

The security or Guarantee for the **payment back** or **reimbursement** of the credit, including the IR of 5% p.a, shall be secured by one of the following Six (6) major Nigerian banks (First Bank of Nigeria Plc., (FBN); United Bank for Africa Plc. (UBA); Union Bank Plc. (UB); Zenith Bank Plc. (ZB); and Guaranty Trust Bank Plc. (GTB). Other financial institutions, which provide debt finance are **finance companies**, **building societies**, **insurance companies** and **investment banks** and more.

Cost of finance

An important aspect of the funding structure is its cost of pricing. Considerations about the cost of finance are usually integrated within the overall investment proposition of the project.

Cost of equity finance

Within this context, investors commonly adopt two valuation methods to gauge the cost of equity finance. These are reported in Figure 1.18 below. One method employs the Discount Cash-Flow (DCF) model, which approximately says that the cost of equity of hurdle rate is made up of an initial income yield return and expected capital return. This

approach is commonly used by private investors, valuers and developers. A second approach refers to the Capital Asset Pricing Model (or CAPM). It is essentially a one-factor risk model, which partitions the cost of equity into two components: a risk-free rate (commonly taken to be the market interest rate on a long-term government security or bond) and market risk (which embeds systematic risk (denoted by beta) and an equity risk premium (the difference between the expected market return and the risk-free rate). This approach is commonly used by MDACI/MDACI Consortium and other listed electric energy generation players.

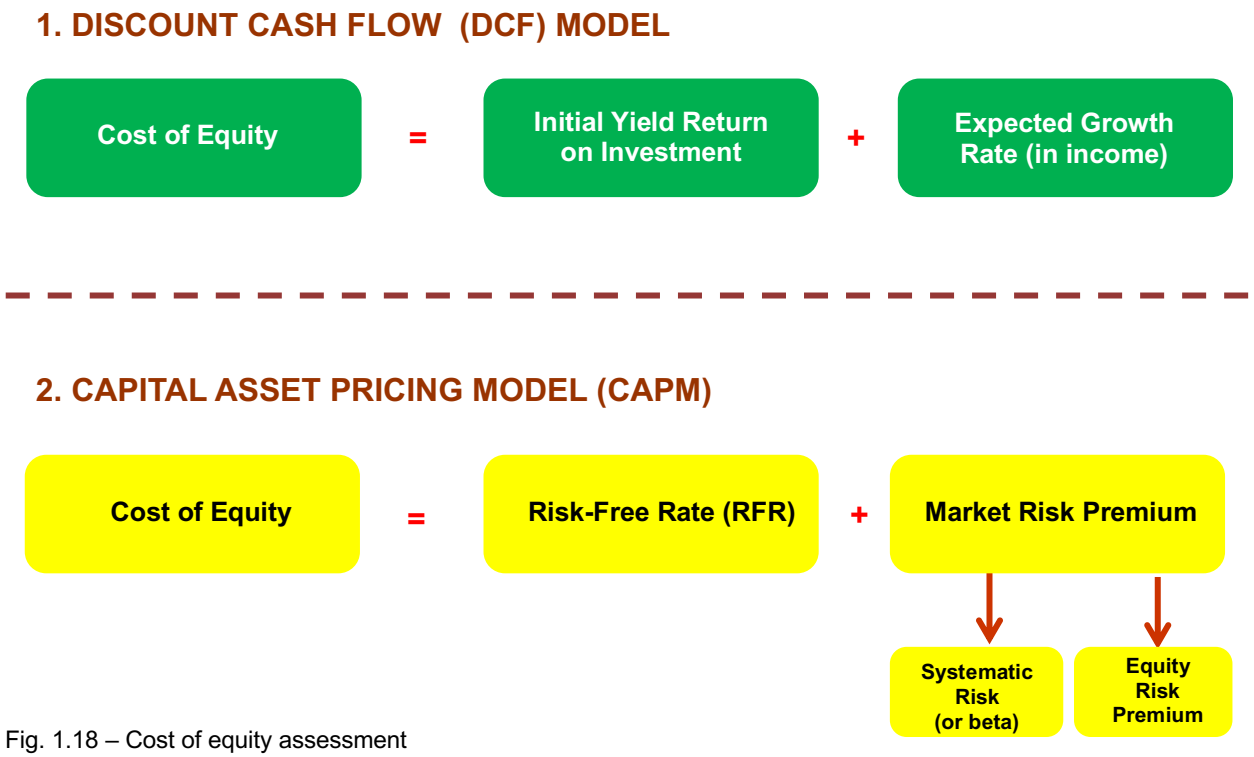

Fig. 1.18 – Cost of equity assessment

Cost of debt finance

Determining the cost of debt usually requires consideration of the risk-free rate and key risk factors. As mentioned earlier, the risk-free rate is based on the government bond rate. Key risk factors include: i) the maturity profile of the debt or loan (usually, the longer the maturity term, the riskier it is), and ii) the default risk of the loan (which tends to rise with lower credit grade). Typically, investment grade credit rating is from 1 and above. **Nigeria is rated at 5**. It is also necessary to consider this fact for the purpose of this Project. Foreign investors and financiers are sometimes very sceptical about investing in Nigeria, due to this investment grade credit rating.

Mezzanine financing of 15% equity contribution by the Project Company

Mezzanine financing is generally a hybrid of debt and equity financing. It includes senior subordinated debt, convertible subordinated debt (is convertible into shares) and redeemable preferred stock (essentially a form of equity which pays a franked dividend). In terms of capital structure, it is subordinate in priority of payment to senior debt, but senior in rank to common stock or equity. Its advantage is that it is treated like equity on a company's balance sheet and hence, makes it easier to obtain standard bank financing.

Figure 1.17 above provides a typical financing arrangement for an industrial property (or real property) development and construction project with mezzanine debt.

The first level of financing, representing about half the required capital is usually bank debt. The average market cost for this is around **5-8% pa**.

The second level of financing, representing about **35-45%** of the required capital is in the form of mezzanine debt. Average market price for this is around **10-12% pa**.

The final level of financing is usually arranged by the MDACI Consortium. The cost of this capital ranges between **14-20% pa**.

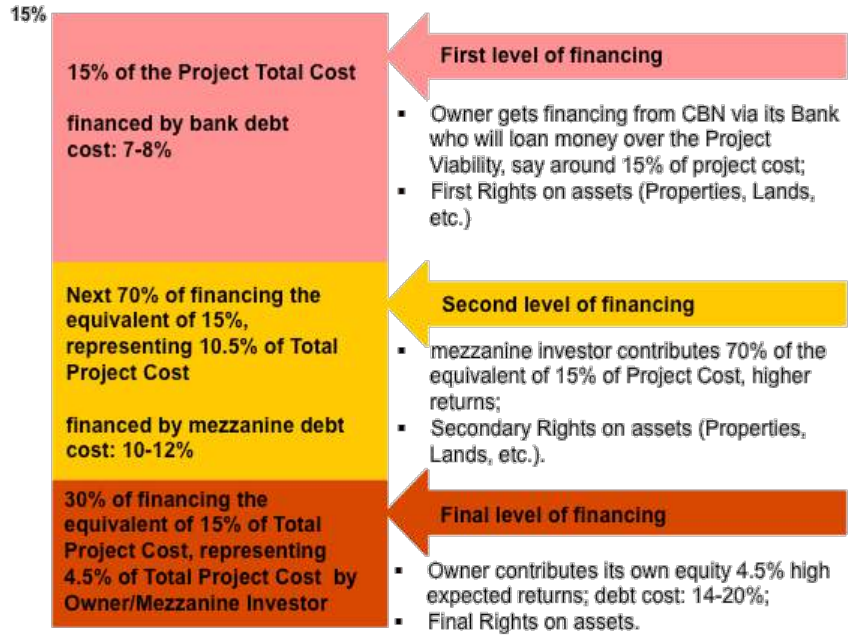

Fig. 1.19 – Mezzanine financing

1.3.3 FINANCIAL SUPPORT SCHEME BY EXIMBANKA SR

As in any European prime export bank, most of the sources of funding are organized through the following financial tools called Buyer Credit or Seller Credits. Buyer Credit is mostly used for better transparency in the funding procedure of technology and service provided by an Exporter or a Local Supplier. Seller credit can be useful when buyer is short of the cash required to make for the signature of the EPCI Agreement between the Contractor (Exporter or Local Contractor/Supplier) and the Project Owner, hereinafter referred to as EUL.

For the purpose of this analysis, MDACI propose to use the case of BUYER CREDIT SCHEME, which is the most efficient financial tool for the development and implementation of such project with such magnitude. In this FINANCIAL SCHEME, the Buyer (Project Owner) and the Supplier (Technical Partner) shall enter a Technical Partnership Agreement (TPA). The basic term and conditions of this TPA satisfactory to EXIMBANKA SR/EGAP for the reimbursement of the loan are as follows:

- Technical Partner and Slovak EPC Company, IEI shall be responsible for the 80% responsible for the management, operation and maintenance of the power plant Project under contract till full reimbursement of the loan provided by EXIMBANKA SR;

- MDACI Consortium composed of MDA CAPITAL INVEST, a.s. (Czech Investment Company), EUROMADE ENGINEERING & CONSTRUCTION LTD (Nigeria Power and Energy Company and subsidiary of MDACI), shall be responsible for:

  - coordinating between the stakeholders;

  - troubleshooting and planning independently the improvement of the project quality and economy by IEI; and

  - following-up and controlling independently in cooperation with the Project Company (XENERGI LTD) payment collection and deposit directly to the Project Account in GTB PLC., the local receiving bank and payment of the monthly or yearly due amount to the EXIMBANKA SR.

1.3.3.1 Buyer's export credit

A Buyer's credit is based on a separate loan agreement between the exporter's bank (EXIMBANKA SR) and the buyer (or buyer's bank).

It enables realization of more complex and large-scale Slovak deliverers to foreign importers.

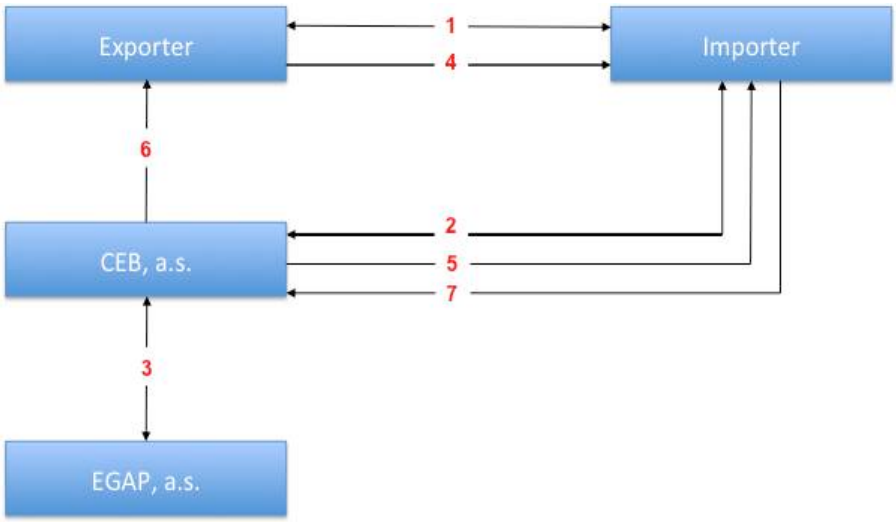

Fig. 1.20 – Buyer export credit scheme

1) Export contract for the delivery of goods and/or services;

2) Credit agreement;

3) Insurance policy covering credit risks;

4) Delivery of goods and/or services;

5) Buyer's Credit;

6) Credit disbursement in favour of the exporter; and

7) Credit repayment

Pursuant to the amendment of Act 58/1995, EGAP insurance is no longer a condition for the provision of supported financing. Depending on EXIMBANKA SR requirements, EGAP insurance may be substituted by another form of security

How does it work?

The primary features of the Supplier Export Credit (SEC) are:

- The exporter grants a loan to the buyer and sells its claim to the bank for refinancing purposes.
- The Foreign Exporter (FE) contracts with their international buyer to supply goods and/or services;
- A separate and parallel Loan Agreement is entered into between a Lending Bank and the Exporter or their Bank, in order to finance the exporter's supply of goods or services on credit terms;
- The Lending Bank (LB) receives a Bank Guarantee (BG), which covers the risk of default on repayment, as security to provide this loan.
- The LB advances the funds to the Exporter in line with the terms of the Export Supply Contract, which typically results in the Exporter being paid in full by the time the goods have been shipped or the project has been completed;
- The Buyer's Bank or Electricity Bulk Purchaser's Bank makes loan repayments to the Exporter's Bank in accordance with the agreed repayment schedule, which is normally 5-10 years maximum, equal instalments of principal and interest.

What are the benefits?

Like the other products, Buyer Credits (BC) can provide an exporter with a competitive advantage of being able to grant a term of credit to its Buyer, whilst receiving up-front cash payment for its exports in accordance with their standard supply contract. However, the key benefit of a BC is that the Loan Agreement is separate from the EPC Agreement (Supply Agreement) and is not subject to Supply Contract disputes.

When should it be used?

Loan Agreements require extensive and lengthy legal negotiation. Due to the costs involved with drawing up a separate Loan Agreement, a BC is most useful for export transactions of € 10 million (Ten Million Euro) and above.

We recommend that an Exporter and Buyer contact their respective Banks as soon as a potential deal is anticipated and provides as much of the information available on the deal and buyer as possible.

Advantages for the exporter and the importer respectively in general

- A credit transaction becomes a cash transaction;
- Attractive interest rates (Euro, SERV-cover);
- SERV enables financing in countries where other possibilities are limited;
- Full or partial discharge of the exporter from the risks;
- No collection and “reminder” work for the exporter;
- Improvement of liquidity

1.3.3.2 Regulation of combating bribery in international trade

Requirements related to project entities & EXIMBANKA SR’s obligations

Pursuant to the OECD documents above, exporters (or applicants for state supported financing) must, among other things.

- Declare that they are aware of the provisions of the OECD Convention on Combating Bribery of Foreign Public Officials in International Trade, and agree to take all measures necessary to comply with them;
- Demonstrate that they have developed and apply management control systems that combat bribery in accordance with the Export legal system;
- Declare that neither they nor anyone acting on their behalf such as agents have been or will engage in bribery in the transaction in question;
- Declare that neither they nor anyone acting on their behalf in connection with the transaction are currently under charge, or have been convicted within a five-year period prior to the application, or have been subject to equivalent administrative measures for violation of laws against bribery of foreign public officials of any country;
- Upon demand disclose the identity of persons acting on their behalf in connection with the transaction and the amount and purpose of commissions and fees paid, or agreed to be paid, to such persons.

The OECD documents oblige EXIMBANKA SR

- To verify and ascertain whether exporters or applicants are listed on the publicly available debarment lists of the international financial institutions (in particular of the

World Bank group);

- To undertake enhanced due diligence if (i) the exporters or applicants appear on the publicly available debarment lists or (ii) the bank becomes aware that the exporters or applicants or anyone acting on their behalf in connection with the transaction is currently under charge, have been convicted within a five-year period prior to the application, or have been subject to equivalent administrative measures for violation of laws against bribery of foreign public officials of any country or (iii) there is reason to believe that bribery may be involved in the transaction;

- To inform the law enforcement authorities promptly if there is credible evidence of bribery at any time in connection with the award or execution of the export contract;

- To suspend approval procedure of the application during the due diligence process if, before credit or other support has been approved, there is credible evidence that bribery was involved in the award or execution of the export contract, and to refuse to approve credit or other support if the enhanced due diligence concludes that bribery was involved in the transaction; and

- To take appropriate action such as denial of payment or refund of sums provided in the event bribery has been proven after credit or other support has been approved.

1.3.4 PROJECT EXPORT CREDIT GUARANTEE – INSURANCE

1.3.4.1 Insurance of a medium and long-term export buyer's credit

An export buyer credit is a credit extended by a bank to a foreign importer for purchase of goods or services. The bank pays the exporter and the owed amount is then repaid by the foreign importer on a regular schedule stipulated in the credit contract. The recipient of the credit and afterwards the debtor is in some cases the bank of the foreign importer. The maturity of the credit exceeds 2 years. Conditions of insurance are governed by the OECD Arrangement; these rules require a down-payment by the foreign importer of at least of 15 per cent before the credit is extended. EGAP also reserves the right to request from an exporter to submit an environmental impact assessment of the export in the importer's country. The insured is the bank that is covered against the risk of the non-repayment of the extended export buyer credit on the stipulated schedule.

An insurance loss is a partial or full non-repayment of the insured credit from commercial or political reasons or their combination. Commercial reasons are general inability of an importer to pay for own due obligations (insolvency) or refusal of the payment without any legal reason (protracted default). Among political reasons belong e.g. administrative decisions or legislative measures of the importer's country preventing the importer from payment, or restrictions in conversion of payments as a result of political occurrences in the country of the importer as well as other events in the country of the importer as war, revolution, civil disorders and natural catastrophes.

The amount of insurance premium depends on the volume of export, negotiated payment conditions, on way how payments are secured, assessment of character and risk level of the importer, assessment of risk level of country or territories related to performance of

the export contract and on the amount of the self-retention. The negotiated amount of the insurance premium already includes possible increase or decrease of the insurance risk and is unchangeable during the whole duration of insurance.

1.3.4.2 Insurance of a Credit for the Financing of Investments

All calculations made are not binding. Final premium rates are only indicative. It covers the corporate risk only as well as those business transactions where no credit has been extended for insurance premium and down payment. The coverage policy as well as the exact premium will depend on individual terms stated in a Credit Insurance Proposal Form

- **Input Date**
  - **Country** – Nigeria (country of category 5);
  - **Total Investment Capital.**

Table 1-13: Financial assumption – tabulated financial information

S/N	Item	Value [US$]	Value [CZK]
1	Investment Capital (CI)	x	x
2	Equity Contribution (15% Cash of CI)	x	x
3	Credit - principal	x	x
4	Grace Period	x	x
5	Repayment Period	x	x

NOTE 1:
The Total investment Capital does not include the followings:
- *Including Project O&M for a period of 3 months;*
- *Delivery Cost to construction site;*
- *Port charges; and*
- *Installation and commission fees.*

NOTE 2:
This investment conditions are negotiable based on the followings concluded assumptions defined in the Project techno-economic studies.
- *Grace period (Months);*
- *Payment back/loan reimbursement period (Months); and*
- *Guaranteed Power Purchase Agreement (PPA)*

1.3.4.3 General insurance conditions against the risk of non-payment

These General Insurance Conditions are effective from 4 September 2009. *See* **APPENDIX 2** of this PAM.

1.3.4.4 Rules for origin of goods

The share of Slovak goods and services in the total value of the export as one of basic conditions of insurance with state support has to reach at least 50 per cent. An exception in the form of a lower share is possible only in transactions when the exporter unequivocally evidences those goods necessary for completion of the export are not produced in the Slovak Republic.

Decisive for determination of the Slovak origin of goods is that the exporter invoicing these deliveries to a foreign buyer is a company registered in the Slovak Republic or its foreign subsidiary. Similarly, sub deliveries purchased by the exporter from other Slovak

production companies are considered as deliveries of Slovak origin. Requirement of the Slovak origin of the goods is fulfilled also in case of sub deliveries which the exporter and/or his Slovak sub supplier has purchased abroad but their value has been further increased in production for export. Only such sub deliveries purchased by an exporter abroad and subsequently resold to a buyer are considered as goods and services of foreign origin for purposes of determination of the required share.

From the calculation of the Slovak share are excluded entirely:

- foreign sub deliveries for which EGAP gained reinsurance;
- foreign sub deliveries financed without the Slovak state support (without EGAP's insurance and EXIMBANKA SR 's financing/refinancing); and
- foreign sub deliveries covered by counter guarantees.

1.3.4.5 Environmental Impact Assessment of an export or investment credit

Principle of sustainable development requires reduction of negative impact of human economic activities on environment. Review of environmental effects of the export and investment has been a standard procedure in a majority of developed countries and it is one of basic conditions for the financing of export projects for institutions from the World Bank Group, development agencies and regional development banks.

The OECD Recommendation on Common Approaches on Environment and Officially Supported export credits came into force on January 1, 2004. It contained an undertaking of all member countries not to support through their institutions those projects, which harm environment. The OECD Council approved the revised Recommendation in June 2007 coming into force on September 1, 2007.

All EGAP's procedures are in compliance with effective international rules in the area of environment protection, including the revised Recommendation of the OECD Council. Review of environmental impact in the county of final destination is one of basic conditions in insurance of export and investment; an expert opinion has to be prepared for project where a significant negative environmental impact can be foreseen. EGAP always acts in a way not prolonging inadequately the appraisal of an application for insurance and not burdening clients with out-off proportion expenses.

Environmental review shall be made for all projects where the Exporter applied for insurance of a credit with state support with maturity exceeding 2 years as well as for all investment in foreign countries. Responsibility for environment compatibility of the project rests always with the main supplier. As long as the Slovak exporter is in position of a subcontractor, the submission of a review prepared for the main supplier is sufficient.

The insured has an obligation to inform public in cooperation with EGAP on impact of the export on environment while respecting trade secrets, intellectual and industrial property and know-how.

1.3.4.6 Procedures in reviewing environmental impact of export and investment in country of final destination

A positive assessment of environmental acceptability of the export and investment in the country of final destination is one of basic preconditions for conclusion of an insurance contract. Environmental review shall be made for all projects where the Exporter applied for insurance of a credit with state support with maturity exceeding 2 years as well as for all investment in foreign countries (hereinafter the "export").

Process of assessment of environmental impact of the export in the country of final destination is starting with submission of a filled-in Questionnaire for environmental review of the export project. The Questionnaire is to be filled-in by the Exporter also in case insurance is requested by a bank extending, e.g. a buyer credit for the financing of the export. **It is indispensable that the Exporter submits the filled-in Questionnaire as soon as possible, i.e. during start of negotiations on financing and insurance of the export.** Based on this Questionnaire, EGAP shall classify the export into one of 3 below described categories and shall decide whether it is necessary or not to prepare an expert opinion on the environmental impact.

In other cases, the Exporter shall submit the Questionnaire including the statutory declaration directly to EGAP together with application for insurance and EGAP may refrain from requirement for further reviewing of the environmental impact of the export.

Environmental classification of the project

Pursuant to the rules and regulations established by the Nigerian Electricity Regulatory Commission (NERC), a new electricity power project shall have an approved Environmental Impact Assessment (EIA) by the Federal Ministry of Environment (FMENV). The EIA shall be based on the international, world bank and local environmental rules and regulations.

Therefore, based on the filled-in **Questionnaire** provided in **APPENDIX3** and recommendation of EGAP, A.S. and EXIMBANKA SR our experts have classified this power project into **category A**, where significant adverse environmental impacts can be assumed. These environmental impacts go beyond an area where the said export will be realized, consisting primarily of exports to **sensitive areas or sectors.**

Procedure for assessing the environmental impact of an export transaction

During the assessment of the Project's EIA, MDACI's experts shall ensure that all the following environmental impacts are clarified:
What is the purpose of placing export transactions in categories?

Placing export transactions in categories allows decisions to be made regarding subsequent environmental review.

Since the project is already classified into **category A**, MDACI/MDACI Consortium must submit to EXIMBANKA SR a recognized and approved Environmental Impact

Assessment (EIA) by the federal and state environmental authorities of Nigeria. A condition for the provision of export financing is the submission of an assessment and compliance of the project's parameters with it.

Assessments are carried out at the cost of the exporter, always by a person authorized for this purpose by the Ministry of the Environment of the Slovak Republic and according to international rules (the World Bank Pollution Prevention and Abatement Handbook). EXIMBANKA SR will provide the Applicant with a list of authorized persons, including their contacts.

In the case of category B, the assessment will not include all the information about the environmental impacts of the project required for category A, but only information on the extent of the potential specific adverse environmental impacts of the export. The actual content and scope of the assessment for a project placed in category B is stipulated by the authorized person taking into account the international rules.

When preparing the assessment the authorized person will take account of the state of the environment at the export's final destination at the time the application for export financing is submitted, will assess the environmental impacts relating to the preparation, implementation and operation of the selected export as well as its termination, and will assess the regular operation and the possibilities of accidents. The assessment must include the requisites stipulated by international rules.

What is a recognized assessment?

If the Slovak Exporter is not the main project contractor, for the purposes of assessing the environmental impacts of the respective project the submission of an already existing assessment prepared **abroad is sufficient**. The assessment can thus be substituted by a so-called "**recognized assessment**", which may be:

- An assessment in English prepared by an entity in the final destination country for the respective project according to that country's legislation, on condition that the assessment complies with international rules. The Applicant will ensure that the assessment complies with international rules via the authorized person;

- An assessment in English recognized by an international financial institution if the respective export transaction is part of a project financed by that institution;

- An assessment in English recognized by the export credit agency of an OECD country if the respective export transaction is part of a project for which this agency is providing insurance or financing.

Are there any possible exceptions from these rules?

Yes; although all export projects are subject to a primary assessment (questionnaire), the Common Approaches give EXIMBANKA SR a certain amount of freedom when making a decision about the processing of a detailed assessment, namely in cases when:

- The export financing is provided in connection with an export transaction that

makes up less than 5% of the value of the whole project; in this case EXIMBANKA SR may decide that the assessment will be prepared in accordance with the limits given in special legislation (*see* **APPENDIX 3**).

- It is clear from the submitted documents that the value of the export transaction does not exceed our preliminary estimation of **€ *15,500,000* (Fifteen Million and Five Hundred Thousand Eur)** and it is also clear that the project will not have a significant adverse environmental impacts; in such a case EXIMBANKA SR may decide to release the respective export transaction from the requirement for a detailed Environmental Impact Assessment.

EXIMBANKA SR will inform the Applicant of its decision regarding an exception in writing without delay.

Will somebody monitor compliance with the environmental requirements stipulated in the assessment?

During the entire life of a credit EXIMBANKA SR is entitled to require the exporter to provide written monitoring reports that include the requisites stipulated in the assessment. The reason for such a request may be any information or suspicion that during the execution of the project there has been environmental damage. The obligation of the exporter to comply with the conditions in the assessment will be one of the conditions for the provision of the export financing.

The Applicant will submit the monitoring reports to EXIMBANKA SR; the exporter will ensure their preparation by an authorized person at its own cost.

What will happen if an export does not comply with the parameters stipulated in the assessment?

If a monitoring report demonstrates serious non-compliance with the conditions of an assessment by the exporter, EXIMBANKA SR will be entitled to suspend financing until the situation is brought into compliance with the assessment. EXIMBANKA SR will inform the Applicant in writing of the suspension of financing and the conditions for its renewal.

EXIMBANKA SR will renew financing only on the basis of a new monitoring report submitted by the Applicant that demonstrates that the conditions of the assessment stipulated for the environmental impacts of the respective export transaction have been fulfilled.

1.4 PROJECT ENTITIES

1.4.1 PROJECT COMPANY / PROJECT OWNERS

1.4.1.1 ENPOWER FREE ZONE ENTERPRISE MANAGEMENT COMAPNY

ENPOWER FREE TRADE ZONE MANAGEMENT COMPANY (EFTZMC), is an Nigerian licensed free zone management company, whose primary business activity is to develop,

build, own and operate Free Trade Zones within Nigeria. EFTZMC is the sole owner and major shareholder of the Enugu Trade Zone (or Enpower Free Trade Zone). EFTZMC a has engaged the project company, XENERGI LTD, to build, develop, own and operate this 10 MWh IGCC power plant with the Enpower Free Trade Zone under an **Implementation Agreement**. XENERGI shall generate the required amount of 10 MWh electric power and sell directly to the EFTZ's operating companies under a Connection Agreement. The main conditions of the Implementation Agreement include:

- **The Investment Security:** EFTZMC shall issue to XENERGI LTD a Bank Guarantee (BG) for the security and protection of its investment within the Free Trade.

- **The Construction Site Acquisition:** EFTZMC shall provide the 1.6 ha of land require for the construction of the 10MWh to XENERGI LTD under a Lease Agreement or Purchase Agreement.

1.4.1.2 XENERGI LIMITED / XENERGI CONSORTIUM

XENERGI LTD (aka XENERGI) is a Nigerian energy Company, which is engaged in developing, building, owning and operating energy and electric power facilities. One of the Energy assets of XENERGI the Ebendo Gas Plant. XENERGI shall form a Special Purpose Vehicle (SPV), regrouping a group of investors under a **Joint-Venture Agreement** to secure the necessary financial equity, including the 15% equity share required by the financier for financing the Engineering, Procurement, Construction and Management (EPCM) of the Project.

XENERGI LIMITED is headquartered at Plot 282b Trans-Amadi Industrial Estate, Port Harcourt, Rivers State, Nigeria (headquarters for Africa). XENERGI LIMITED has also other headquarters in USA (for America) and India (for the Middle-East).

XENERGI LIMITED is also established for the following objectives:

1) To develop, build, own and operation energy resources (mining, oil & gas, etc.), properties, estates, transportation systems (air, sea, and ground transportation systems); water treatment plant, amusement parks, recreational areas, warehouses and shops;

2) To carry on any business within the area of Nigeria as the Authority may permit under the terms of the license issued to the Company as may amended from time to time by Nigerian Authority;

3) to develop, manufacture, repair, modify, sale and engage in leasing of air, sea, and ground vehicles;

4) to market refined petroleum products (Filling stations and Storage facilities);

5) to provide technical, economic and management consulting services;

6) to build, fabricate, develop, maintain, repair, design, architectural, electrical and structural facilities;

7) to acquire all licenses, concessions, grants, permits and powers necessary to offer telecommunication technologies and systems services intended to be used for purposes of and in connection with business of the Company;

8) to borrow, grant security, guarantee any obligation or any person as may be necessary in the course of carrying out the business of the Company;

9) to draw, make, accept, endorse, discount, negotiate, execute and issue promissory notes, bills of exchange, bill of lading, warrants, debentures and other negotiate and transferable instruments;

10) to apply for, promote and obtain any Act of National, charter, privilege, concession, license or authorization of any government, state or municipality, or any other department of authority, or enter into arrangements with any such body, for enabling the Enterprise to carry out any of its objects into effect or for effecting any modification of the constitution of the Enterprise or of any other purpose which may seem to the Board of Directors to be expedient, and

11) to oppose any proceedings or application, which may seem calculated directly or indirectly to prejudice the interest of the Company;

12) to any for any rights or property acquired by the Company and to remunerate any person or enterprise, whether by cash payment or by the allotment of shares, debentures or other securities of the Company credited as paid up in full or in part, or by any other method the board of director thinks;

13) to co-ordinate, finance and manage all or any part of the operations of any enterprise which is a subsidiary Company of or otherwise under the control of the Company and generally to carry on the business of a holding Company;

14) to carry on through any subsidiary or associated Company any activities which the Company is authorized to carry on and to make any arrangement whatsoever with such Company (including any arrangements for taking the profits or bearing the losses of any such activities) as the Board of Directors thinks fit.

1.4.2 TECHNICAL CONSORTIUM

1.4.2.1 Project Development Consortium

The Project Development Consortium is formed by MDACI Working Group, which is constituted by different power and experts from European power equipment engineering, procurement, construction and installation Companies. During development, IEI (main EPC Contractor) provides inputs for design and technology compatibility. EUROMADE ENGINEERING & CONSTRUCTION LIMITED (EUMEC), a Nigerian registered Company and subsidiary of MDACI is responsible for the coordination local tasks (data collection,

construction site preparation, documentation, licenses and permits from governmental authorities and agencies, etc.).

At least a number of 15 experts from different fields of expertise are directly engaged by MDACI for the development of the power Project.

MDA CAPITAL INVEST, A.S

MDA CAPITAL INVEST, A.S. (MDACI) is a Czech Joint Stock Investment and Export Support Company, whose primary business activity is to support the export of Slovak products by helping domestic manufacturers to increase sales and profits, reduce dependence on the domestic and European markets and stabilize seasonal fluctuations. MDACI main partners are the Export-Import Bank of Slovak Republic (EXIMBANKA SR) (financier) and the Export Guarantee and Insurance Corporation, a.s. (EGAP) (credit insurance corporation). MDACI focuses on the newly developed export markets, consisting of Africa, South America, Asia and the Middle East.

MDACI's main business activities include:

- Energy (petroleum products including renewable energy, and mining);
- Power (generation, transmission and distribution);
- Infrastructure (transportation technologies, transportation systems and ITC, security, roads, railways, water ways, airports, etc.);
- Health (hospitals, medical technologies, cosmetics, etc.);
- Agriculture (agricultural technologies and products); and
- Educational Services (trainings & education);

EUROMADE ENGINEERING AND CONSTRUCTION COMPNY (EUMEC) is a subsidiary of MDACI, which is a civil engineering company established in Nigeria. The Company is a formed by a group EU engineering and Construction Companies, which shall secure all the necessary technical expertise and civil engineering works of the projects developed by MDACI Consortium in Nigeria and in Africa.

As the Project Developer, MDACI/MDACI Consortium's Scope of Works described within this section is specifically for those projects that employ the Conventional Project Delivery Method *(Design-Award-Construct-Install-Inspect-Commission-Deliver)* defined as follows:

a) The Developer shall be responsible for the data collection necessary for the technical design (architectural, structural, mechanical, electrical design) and quality and quantity surveys of the main parts of the Projects (Buildings, Roads, Bridges, Canalizations, Wastewater Treatment Plant, etc.), which satisfies the project specifications, consistent with all the relevant statutory and other *STANDARDS* and guidance, and is within approved *COST,* and on *TIME.* The

Developer shall be responsible for the direction and co-ordination of the work of all the Contractors, Consultants, and Sub-consultants in the team to the end.

b) The Developer shall furnish all the general and specific requirements necessary for the development and Construction of the whole project.

c) The Developer shall ensure the Pre-feasibility and Full Feasibility Studies reports of each of the Projects Phases and coordinate the Environmental Impact Assessment Studies with the State Ministry of Environment, the Evacuation Studies (if required), permits and licenses with the relevant government agencies.

d) The Developer shall faithfully carry out the duties, which they undertake. The Developer shall also have a proper regard for the interests of both Enugu State Government and those who may be expected to use the project of his work.

e) The Developer must be guided in all professional relations by the highest standards of integrity.

f) The Developer shall make sure that all Contractors, Consultants and Sub-Consultant are duly qualified for the execution of their contracts. The Selection of these Contractors, Consultants and Sub-consultants shall be performed in full due process and corruption free.

g) The Developer shall be the only exclusive responsible for the financial strategy planning of the Project with the aforementioned local and foreign Banks, and other foreign and local investors. The operational business for the purpose of this Project shall be located in Abuja and in Enugu (Enugu State).

h) The Developer shall represent the building sponsors and assume responsibility for the planning, operation and management of the whole Project up to completion.

i) As the Project Company's representative, the Developer prepare proposed solutions, adaptive measures and decisions, provide encouragement and advice, explain, take care of records and documentation, analyse risk and guarantee security for the building security.

j) When conflicts arise, the Developer negotiates with those involved and is often able to introduce situation-specific, problem-solving alternatives, which satisfy both parties. If necessary the Developer will work together with experts in the field of mediation. Mediation is an effective method for obtaining a solution satisfactory to both of the Parties in conflict. The decision factor in the process is the constant participation of the mediator, who functions exclusively as a go-between for the parties.

MDACI is responsible for the development of the Project, carrying the following services for bankability and construction of the Power Plant:

1) Technical Services;

2) Financial Services; and

3) Legal Services.

EUROMADE ENGINEERING & CONSTRUCTION LIMITED

EUMEC, a Consortium of MDA CAPITAL INVEST, A.S. (MDACI) was founded because of the Africa's need for high quality and standards civil objects (houses, road, bridges, power plants, refineries, gas plants, oil & gas storage and distribution pipelines, water treatment plant and distribution networks), environmental restoration, stewardship, and protection of neglected public lands. One of the main objectives of EUMEC is to secure the necessary technical expertise and civil engineering works of the projects developed by MDACI Consortium in Nigeria. While carrying out its engineering and construction works, EUMEC utilizes the resources of the community to provide long-term environmental benefits for natural areas without neglecting the diverse strengths of different ethnics and cultures to accomplish our common goal of restoring the beauty of the natural landscape. We always lay emphasis on design and construction precision, high quality and standards at fair cost. **EUMEC shall be responsible for the Design and Construction of the whole power plant**, including the following civil objects:

1) CF1 – Access roads external and internal roads)
2) CF2 – Main entrance and security post
3) CF3 – Administration and operations management building
4) CF4 – Coal receiving, storage and handling facilities
5) CF5 – Storeroom and maintenance workshop
6) CF6 – Wastewater treatment plant
7) CF7 – Powerhouse
8) CF8 – Stacks / Exhaust ducts
9) CF9 – Raw and clean water storage tanks (concrete)
10) CF10 – Backup gas supply tanks
11) CF11 – Power generation and distribution control room
12) CF12 – Coal gasifier

1.4.2.2 Engineering, Procurement and Construction Contractor

ISTROENERGO INTERNATIONAL, A.S.

ISTROENERGO INTERNATIONAL, A.S. (IEI) shall be lead and main engineering, procurement, construction (EPC) contractor. It is responsible for engaging and selecting the sub-contractors in cooperation with MDA CAPITAL INVEST, A.S. (Developer). Each subcontractor shall provide a 2% Performance Bond (PB) of the total equivalent subcontract value and a 2-year (24 months) operational warrantee to IEI. The main local subcontractor, member of MDACI Consortium, is EUROMADE ENGINEERING AND CONSTRUCTION LIMITED, which shall be responsible for the Civil Engineering part of the Project. EUROMADE ENGINEERING AND CONSTRUCTION LIMITED is a member company and subsidiary (60% of the total share capital) of MDACI Consortium. *See section 1.5.1.2.2 above*.

IEI is one of the biggest Slovak and Czech suppliers of power generation projects and their technological parts.

IEI supplies power generation projects from the design through implementation and assembly to commissioning and securing of both warranty and extended warranty service. The Company is also very active in the reconstruction of existing plants and the supply of balance of plant and services.

IEI is a modern and dynamic corporation operating in Slovakia and in the Czech Republic. IEI is engaged in the business of industrial projects, civic projects, power and energy (petrochemical projects).

In any kind of energy production, the production from fossil fuels is still dominating because of the worldwide reserves, availability and competitiveness. Conversion of the fossil fuels energy to the utilizable form of electric or thermal energy is carried out in thermal power plants and heat stations. Considering the continuous increase of energy consumption worldwide the new thermal power plants and heat stations are being built. Furthermore, the less effective and outdated plants are being substituted by newer ones. The abovementioned has been valid for a long time and it represents a certain cycle within the energy sector. Understandably, the development results in various innovations within this cycle from both the technological and the partnership point of view. Technological innovations focus on effectiveness of the energy production, emissions and safety. The innovations in terms of business partnerships represent the changes in the structure of energy producers and their varying scopes of involvement in the energy production.

IEI entered the energy market in 1992. Since its establishment IEI has been building its position on the energy markets and it is constantly in a process of reinforcing its position of an important element in worldwide energy business. IEI has become a confident supplier of new power producing units designed for conversion of fossil fuels to electric and thermal energy. Creativity and independence have always been IEI`s unique attributes representing a strong foundation based on principles of creating and developing its own know-how. Within its activities on the energy markets IEI focuses on the latest technologies from the field of fossil fuels utilization. In addition, IEI strives to provide complex and tailor-made services to its customers on turnkey basis. IEI is not limited by territory, size or types of the energy source. The ability to cooperate with diverse types of investors, banks and business partners producing or procuring energy equipment is another significant feature of the company.

IEI is a creative and dynamic company built on solid foundations of creative potential and a number of self-built reference projects. Above all, it is a company with ambitions to grow further in terms of volume, territories and partnership position and especially in terms of quality of provided services.

The most valuable asset of IEI is its employees and their professional, proactive and friendly approach to its clients. Actually IEI employ more than 600 engineers, managers, administrators, and trade specialists. IEI is a member of many respected organizations and its work is inspected and supervised by renowned international certification institutions. Certified Quality Management System, Workplace health and safety, and environmentally friendly approach to all its activities are part of its corporate philosophy. The works of IEI are controlled by internal procedures and bylaws, which are compatible with “Integrated Management System. Today, IEI continues to be a reliable partner for

any project, whatever the size and place.

NOTE
The Main Contractor/Supplier shall provide a Performance Bond (BP) of 2% (Two percent) maximum pursuant to the ICC Publication No. 458 INCOTERMS 2010 for EPCI (Engineering Procurement Construction and Installation) Agreement. This PB shall cover a period of Two (2) years guaranteeing the Contractor's performance, the quality, and operation of delivered technologies or implemented part of the project.

As the Main Contractor, IEI is responsible for:

1) Power Plant construction;
2) Power Plant technologies and equipment supply or procurement;
3) Installation;
4) Test;
5) Commissioning; and
6) Quality Warrantee of the Power Plant for a period of 24 months.

1.4.3 FINANCIAL GROUP OF THE PROJECT

1.4.3.1 Financier

EXIMBANK SR

The Export-Import bank of the Slovak Republic (EXIMBANK SR) was established under Act No. 80/1997 Coll. on the Export-Import bank Slovak Republic, amended by Act No. 336/1998 Coll., Act No. 214/2000 Coll., Act No. 623/2004 Coll. and Act No. 688/2006 Coll. and started its activities on 22 July 1997. The founder of EXIMBANKA SR is the state.

The main objective of the institution is to support the maximum export volume of sophisticated production to the numerous countries, while ensuring the return on investment through the minimization of the risks arising from insurance, credit, guarantee, and financial activities. EXIMBANKA SR assist both large and small (SME) companies and is prepared to provide solutions tailored to companies' specific needs. It is the only institution in the Slovak Republic authorized to provide export financing and pure cover backed by the government.

The EXIMBANKA SR mission is to provide state support for exports through the provision and financing of export credits and other services connected with exporting.

EXIMBANKA SR thus supplements the services offered by the domestic banking system by financing export operations that require long-term financing at interest rates and in volumes that are not available to exporters on the banking market under the current domestic conditions. This allows Slovak Exporters to compete on international markets under conditions comparable to those enjoyed by their main foreign competitors.

The recipient of supported financing may be an exporter (i.e. a legal entity with registered offices in the Slovak Republic, or in exceptional cases a natural person with permanent residency in the Slovak Republic), or their foreign customer. A manufacturer producing for export or a Slovak subject investing abroad may also receive some types of credits. The exporter's domestic bank or the importer's foreign bank may also be involved in these transactions. All EXIMBANKA SR activities are fully compliant with World Trade Organization (WTO) rules, the applicable recommendations of the Organization for Economic Co-operation and Development (OECD) and European Union directives.

1.4.3.2 Export credit guarantor and insurer

EXPORT GUARANTEE AND INSURANCE CORPORATION, a.s.

EGAP, a.s. is a credit insurance corporation, insuring credit connected with exports of goods and services from the Slovak Republic against political and commercial risks uninsurable by commercial insurance.

From the point of view of business parties the political risks are of a force majeure nature. They include for example administration or legislative measures in the country of the borrower that prevent it from payment, or even political events in the country of the debtor in the form of revolution, war, general strikes, etc. Commercial risks are connected directly with the borrower and take a form of insolvency or denial of payment of claims.

EGAP insures in particular bank loans due in over 2 years, intended to finance export of energy, machinery and technological systems, investment projects, transport constructions and investments, usually to countries where political, economic and legal environment increases the risk of default.

It complements the range of commercial credit insurance products and fills the gap on the market and acts as a standard export credit insurance company in the role of a government tool to promote exports. The corporation provides insurance services to all exporters of Slovak goods, services and investments, irrespective of their size, legal form and volume of insured exports.

EGAP was founded in 1992 as a joint stock company fully owned by the state. The Czech Republic exercises its shareholder rights through the Czech Ministry of Finance, the Czech Ministry of Industry and Trade, the Czech Ministry of Foreign Affairs and the Czech Ministry of Agriculture. Its activities are governed by the Insurance Law and the Act No. 58/1995 Coll., on insuring and financing state supported export.

Short-term commercial insurance against risks of non-payment resulting from insolvency or protracted default of a foreign or domestic buyer is offered by *KUPEG úvěrová Pojišťovna, a.s.* co-owned by EGAP and the Belgian credit insurance company Ducroire – Delcredere SA. N.V.

1.4.4 OPERATIONS MANAGEMENT OF THE PROJECT

1.4.4.1 Lead operations management company

EUROMADE ENGINEERNG AND CONSTRUCTION LIMITED

EUROMADE ENGINEERNG AND CONSTRUCTION LIMITED (EUMEC) is engaged under contract by the IEI (Lead Contractor) to assure the Operations Management (Ops Mgt) of Projects on its behalf and in cooperation with XENERGI LTD, MDA CAPITAL IVEST, a.s. and EUMEC. EUMEC shall sustainably manage the power plant and train the XENERGI's staff for a period of 8 years maximum i.e. till full payment of loan provided by EXIMBANKA SR.

Operations management focuses on the delicate management of internal business processes to produce and distribute products and services. Many companies, especially those smaller in size typically don't mention "operations management", but they still carry out activities classified as "operations management". Some of these activities which are covered by operations management include product creation, development, production and distribution; although, operations management is in regard to all operations within a firm. Besides, EUMEC's operations management responsibilities shall include managing purchases, inventory control, quality control, logistics and evaluations.

A great deal of the focus of operations management is on the efficiency and effectiveness of the company's processes. Therefore, EUMEC's tasks shall also include substantial measurement and analysis of internal processes.

The Participants XENERGI LTD, and MDA CAPITAL INVEST, A.S. and shall assist EUMEC.

XENERGI LIMITED / XENERGI CONSORTIUM (Project Company)

As the Project owner, future manager of the power plant and actively engaged in the business of exploration and oil fields development services, XENERGI LTD shall appoint the fuel handling manager (quality monitoring, fuel supply and payment, etc.). The Fuel Handling Manager shall report to the Financial and Controlling Director and the Technical Director who shall be appointed by EUMEC (Operations Management Company)

XENERGI LTD shall also appoint the Financial and Controlling Director, who shall be responsible for financial management of the project, including the coordination and monitoring the project daily expenses, the loan payment to EXIMBANKA SR. The Financial and Controlling Director shall also report to EUMEC (Operations Management Company).

MDA CAPITAL INVEST, A.S. / MDACI CONSORTIUM (Project Developer)

During the operation and management of the project, MDA CAPITAL INVEST, A.S. (MDACI) shall be responsible for the coordinating the tasks of all the entities participating in the management and operation of the power plant and their needs required to carry out sustainably their responsibilities. For this purpose, MDACI shall appoint the plant Operations Manager who shall report to the all the Directors of each department of the power plant, including the Managing Director (appointed by EUMEC).

MDACI shall also be responsible for the internal auditing Company. The Internal Auditing Manager who shall appointed by MDACI shall be responsible for managing the execution of a comprehensive internal audit program. This includes conducting audits in a manner in which all relevant risks are assessed through substantive and control-based testing in an efficient manner to determine completeness, accuracy, validity and restricted access and/or effectiveness of the control environment.

The Internal Audit department shall be dedicated to providing independent, objective assurance designed to add value and improve enterprise-wide operations and support compliance. Internal Audit helps the power plant to accomplish its objectives by bringing a systematic, disciplined approach to evaluating and improving the effectiveness of risk management, control and governance processes by providing insight and recommendations based on analyses and assessments of data and business process. The scope of internal audit efforts is broad, and includes the efficiency of operations, the reliability of financial reporting, deterring and investigating fraud, safeguarding assets, and compliance with laws and regulations, including but not limited to testing in support of Model Audit Rule compliance.

1.4.5 CONSULTING SERVICES REQUIREMENTS

1.4.5.1 General requirements and responsibilities

The Consulting Companies shall be qualified to handle Civil Engineering Project Management, Technical Consulting, Energy Contracting, and Placement Order (Turn-Key), Technical Planning and Project Management issues for privates, industrial and public contractors and developers. The Consulting Companies shall also develop also customer-specific system solutions appropriate of the challenge of today's open market.

During development, The Developer will lay emphasis on Consulting Companies that considers it a high priority to provide professional services through guidance during both planning and the realization phases. The Consulting Companies shall handle specific tasks in co-operation with experts in the legal, economic and technical fields of the foreign and local companies.

The Consulting Companies shall also initiate competition to the most cost-effective supply of energy and water facilities.

The Consulting Companies shall also be able to negotiate optimal supply contract for energy facilities for the Clients through the use of competitive procedures. They should be able to obtain reasonably priced, safe and environmentally friendly energy supply conditions. Legal questions which arise during this procedure are answered by a qualified lawyer specialized in the field of commercial laws.

The Consulting Companies shall assist the Client throughout the entire procedure saving as consultant and technical planner. They should be able to develop solutions for the development and implementation and operation for the whole project systems (equipment, technologies, construction materials, fuel, water, electricity, etc.). These solutions can be opened to the market in a competitive procedure.

Their experts should also be planners in the area of Estates, Transportation systems, Logistics, electric energy generation plants, Transmission and distribution networks and application. Their areas of expertise should not be limited to long-distance heating network and interconnecting stations, cooling generation and distributions, gas network, electricity networks, heating and power coupling systems, power plant and technical equipment systems.

The Consulting Companies shall be able to create integrated energy, water and technology concepts and effectively realize them in the planning and construction phases. In the process, consultants will always take care to balance the sometimes conflicting aims of low investments levels and minimal operation expenses. The selective consulting teams will inform the Developer regarding up-to-date economic and technical innovation and select appropriate application strategies.

1.4.5.2 Pre-qualification requirements

Interested reputable consultancy services providers must have necessary competence and submit the following documents:

1) Certificate of the Company's Registration/Incorporation verifiable from Corporate Affairs Commission (CAC);

2) Company's Current Tax Clearance Certificate issued by the proper authority;

3) VAT Registration Certificate;

4) Tax Payers Identification Number (TIN);

5) Evidence from the Company's Bankers as to its financial capacity to undertake the project if awarded. The Prospective Consultancy Services Providers shall be required to demonstrate that they are financially capable to provide the services.

6) Company Profile: evidence of past performance (5 latest years), Curriculum Vitae of the Consulting Company's key staff or experts with passport photo; list of Materials (working tools, machines and equipment);

1.4.5.3 Human resource

GRAFTON RECRUITMENT International

GRAFTON RECRUITMENT is a Company that is driven by instinct and inspired by innovation. As a leading provider of Recruitment, Talent Management and HR solutions and with more than 30 years of experience, GRAFTON is one of Europe's largest independent HR Companies, with 30 offices in 7 countries.

At the beginning of its business activities, the company's core values were established on tremendous amounts of soul searching and discussion. Despite the lively debate, Grafton staffs are all united on one front: the Company business should be an ethical business, with ethics hard wired into unified culture and good conduct

Grafton, endeavours to lay emphasis community development; promoting and enhancing the future of communities. So their responsibilities go further than just keeping systems running and creating a positive social environment.

Now more than ever, transparency, accountability, trust and reliability are essential qualities for Grafton.

Partnership

Grafton Recruitment develops valuable and collaborative relationships between various partners, businesses and states organizations, with the goal to work together to achieve a common purpose, such as poverty reduction, education and community development locally, nationally and internationally.

- American Chamber of Commerce in the Czech Republic;
- British Chamber of Commerce in the Czech Republic;
- Deutsch –Tschechische Industrie – und Handelskammer;
- Slovensko-Česká obchodní komora;
- APPS;
- Czech Irish Business and Cultural Association;
- People Management Forum; and
- Klub personalistů kraje Vysočina.

NOTE
For this purpose, MDACI has already engaged GRAFTON, A.S. under agreement, a Czech Human Resources (HR) services Company for the selection of the Czech expatriates that will be in charge of the O&M of the Project.

CHAPTER II: PROJECT DEVELOPMENT AND IMPLEMENTATION REQUIREMENTS

2.1 INTRODUCTION

For the past decade governments and municipalities have been actively striving to improve people live and to stimulate the economy with the development of electric energy sector. In the Process, several new development projects have been planned and initiated but slow down with the **lack of power**. As already mentioned, the Enpower Free Trade Zone (EFTZ) shall be provided with the following residential, commercial and industrial properties, including infrastructure and facilities that primarily require electric power to operate sustainably and profitably.

a) **Residential properties:** staff and family housing estates.

b) **Commercial properties:** shopping centres, hotels, restaurants, clubs, hospitals,

c) **Industrial properties:** Refineries, manufacturing factories, wastewater treatment plant, and workshops.

d) **Infrastructure:** security lights, security cameras, roads, sewage networks, and warehouses,

e) **Transportation Systems:** bus stations, taxi stations, and heliport.

Without power, these infrastructures will not efficiently operate, which could lead to huge financial losses and bankruptcy of all the implemented businesses within the EFTZ. Without electric power, no business can effectively and efficiently operate (*i.e.* there cannot business at all). It is time that African should know this fact. Electric power and energy are the fuel and servomotor to any business. This is one of the major reasons why Africa is economically extremely poor and most African Governments, including some Businessmen and Entrepreneurs are still not aware about this fact.

The private sector has also been very active with new IPPs everywhere. A strategic planning for the development and implementation of these projects shall always be preceded by feasibility studies, Environmental Impact Assessment (EIA), Geotechnical Studies, and Technical Design (Architectural, Structural, Mechanical, Electrical, and Structural designs), Quantity and Quality Surveys.

Clients who pay for such studies should know what to expect. The purpose of this section is to explain the nature of the development study documents for the 10MWh IGCC power plant and to provide guidelines on the evaluation of their reports.

Most of these studies shall also include a series of General Questionnaire (GQ) consisting mainly of identifying and defining the legal, technical, economical, social and environmental issues of the Project.

As one of the most important documents of the Project, the Full Feasibility Study Report shall include a series of General Questionnaire (GQ) consisting mainly of identifying and defining the legal, technical, economical, social and environmental issues of the Project. It shall also provide answers to all Questions related to the operation and management of the Project.

2.2 PROJECT DEFINITIONAL ISSUES

Any electric energy project cannot be developed and implemented without survey and preliminary evaluations of all legal, technical, economic, social, and environmental issues that are involved. This is the planning stage. It has to be very strategic, clear and transparent, in order to generate concrete and efficient results. The goals of the Project mission cannot be achieved if the development and implementation method is not steadily structured.

This section gives methodical guidance to all the parties involved in the development and implementation of the Project. The series of **Questionnaire (legal, technical and financial)** provide clarity on the different challenges that each party including the Client or Project Owner shall expect during the development and implementation of the Project.

2.2.1 PROJECT CONTRACTS

The Project legal issues consist of rules and regulations that need to be established for the development, implementation and operation of the Project by the following contracts or agreements:

1) Project Implementation Agreement (PIA);
2) Joint-Venture Contract (JVC);
3) Operations Management Agreement (OMA);
4) Project Development Agreement (PDA);
5) Consultancy Agreement (CA);
6) Engineering, Procurement and Construction Agreement (EPCA);
7) Electric Connection Agreement (ECA);
8) Coal Sale and Supply Agreement (CSSA); and
9) Loan Agreement (LA).

2.2.1.1 Project Implementation Agreement (PIA)

This Project implementation shall be established between XENERGI LTD (or XENERGI), hereinafter referred to as the Project Company or Project Owner and ENPOWER FREE TRADE ZONE MANAGEMENT COMPANY (or EFTZMC), hereinafter referred to as the

Free Trade Zone Operator or Owner. As already stated above, the main condition of this Implementation Agreement include:

- **The Investment Security:** EFTZMC shall issue to XENERGI LTD a Bank Guarantee (BG) for the security and protection of its investment within the Free Trade.

- **The Construction Site Acquisition:** EFTZMC shall provide the 1.6 ha of land require for the construction of the 10MWh to XENERGI LTD under a Lease Agreement or Purchase Agreement.

2.2.1.2 Joint-Venture Agreement (JVC)/Partnership Agreement (PA)

This Agreement is established to define the tasks and obligations or rights of all parties involved in the development and implementation of the Project. This section provides a detailed checklist that assist project partners to settle legal issues, mainly in the area of copyright and data protection. The Project Developer and the Project Owner and their local and foreign partners should always be encouraged to conclude a Partnership Agreement, *i.e.* an agreement among all partners of the project, which includes provisions on allocation of responsibilities, copyright issues, data protection, as well as financial questions.

The Joint-Venture Contract should aim at the clarification of ownership of results at several levels:

a) To clarify rights held on pre-existing material to be used;

b) To clarify rights within the partnership;

c) To clarify rights of sub-contractors and staff members; and

d) To clarify rights of partnership in respect of third parties.

The given list below helps to identify key points to be possibly included in the Joint-Venture Contract. These bullets points should be discussed among all partners at the very beginning of the project:

- ✓ Does the project intend to produce material, which could be subject to copyright law?

- ✓ Are there any available funds that cover the pre-operational fees activities of the Project activities? Keep in mind that pre-operational expenses are necessary to kick off a Project. Any project shall have Pre-feasibility or interim studies reports, technical, economical, financial, strategic, as well as professional legal advices, licenses and permits documents before kick-off. Usually, the Project Developer and the Project Owner cover those expenses.

- ✓ If t the Project will use pre-existing material, was it allocated among partners the responsibility for clarifying rights and obtaining a (written) authorization from the Intellectual Property Rights (IPR) owners?

- ✓ If material owned by one member of the partnership is going to be used, did you allocate to the partnership licenses of rights for its utilization (for the purposes of the project)?

- ✓ The same for existing material from third parties: make sure that a (written) authorization has been sought from IPR owners, and any rights have been cleared.

- ✓ Were all necessary conditions of use of the final project well defined, both among partners and for third parties? This will be particularly important for the dissemination and exploitation of the Project.

- ✓ Keep in mind that the question of rights within the partnership could be settled by joint conferral of rights, for example based on a division by territory or by market.

- ✓ If you intend to produce a very innovative product, did you think about including also a confidentiality clause in your agreement?
- ✓ Does the project result from joint cooperation (jointly held rights)? If so, allocate among partners the rights as regards the final results.

- ✓ Will the products be available for commercial use? If so, make sure that the existing agreement includes this possibility in the conditions of use.

- ✓ Will you allocate among partners the right to take action against third party infringements in relation to the project/results?

- ✓ How will any income resulting from the Project and possible relating IPR rights, like royalties, be distributed among partners?

- ✓ Clarify if the ownership of the results will remain in the employee or in the employer. Keep in mind that legislation may differ from one country to another.

- ✓ Consider the possibility of registering the Project in the respective legal authorities/IPR collective management companies.

- ✓ What happens if a partner withdraws from a project? Will he have any right to the final products?

- ✓ Have you taken advice from a qualified lawyer for the drafting of your partnership agreement? Under which law the agreement will be stipulated? What Court will be responsible in case of dispute?

- ✓ Make sure, in the case of government all approvals, permits, incentives and provided by the actual government will remain unchanged. Will any change of Federal or State law affect the Project implementation? If so, what will be the next alternatives?

2.2.1.3 Operations Management Agreement (OMA)

This Agreement is established between XENERGI LTD and MDACI CONSORTIUM (responsible for the Operations Management and maintenance of the power plants – securing efficient operation and incomes collection for the payment back of loan provided by EXIMBANKA SR), and the other parties such as the EPC Contractor, hereinafter referred to as IEI (technical follow up support, spare part supplier, etc.), the financier, herein called EXIMBANKA SR, the Developer, hereinafter referred to as MDA CAPITAL INVEST, A.S. and its Consortium (providing support for the project general coordinating and data monitoring and storing, and auditing, etc.) and the Project Company (XENERGI LTD) (providing local support e.g. incomes collections, local coordination with the local authorities and communities,).

This Agreement shall define the terms, conditions and restrictions on which the aforementioned parties shall be collaborating for a satisfactory and successful operation, management and maintenance of the Project. These conditions shall also include government incentives and other supports.

2.2.1.4 Project Development Agreement (PDA)

A Project Development Agreement (PDA) between the Project Owner, hereinafter referred to as XENERGI LTD and the Developer, hereinafter MDACI/MDACI CONSORTIUM will be established. It is a discretionary tool to be used by XENERGI LTD as a condition of developing and implementing the 10 MWh IGCC power Project. The PDA allows the project to be developed in the given area (construction site) for the purpose described above that is appropriate for all uses allowed or conditional in the requested zone. This Agreement shall identify a complete Scope of Works that the Developer shall carry out for the development, monitoring and implementation of the whole Project. The Project Owner shall be herein, the main shareholder of the Project Company and therefore the main Investor of the Project.

2.2.1.5 Consultancy Agreement (CA)

It is the Contract between the Project Developer and each Consulting Company selected to provide consulting services for the development of the Project.

2.2.1.6 Engineering, Procurement and Construction Agreement (EPCA)

The Engineering, Procurement, Construction and Installation (EPCI) Agreement between IEI (Contractor/Exporter) and XENERGI LTD (Project Company / Owner) should, inter alia, provide for direct payments to be made, set out the terms on which payments are to be made from the loan during the contractual period, and provide for an alternative means of payment in the event that the loan is withdrawn. For some Buyer Credits involving project finance and occasionally for other cover, mostly FINANCIERS will need to be satisfied with the contractual terms. It is important therefore that you approach the FINANCIER as early as possible and before the contractual negotiations are too far advanced.

All the necessary terms and conditions (PB, Technical Support Agreement, etc.) securing the project implementation and operation within the reimbursement period of the loan shall be stated. The EPCI Agreement shall be based on INCOMTEMS 2000 of International Chamber of Commerce (ICC), containing all the Contractor's guarantee and warranty terms and conditions for a period of at least Two (2) years.

2.2.1.7 Coal Sale and Supply Agreement (CSSA)

The Coal Sale and Supply Agreement (CSSA) shall be established between the Project Company, hereinafter referred to as XENERGI LTD (Buyer) Buyer and GoalmarkSuperject International Ltd. (Seller) or any qualified Nigerian Coal trader and supplier.

The main terms and conditions of sale and supplier of Coal to the power plant site shall be regulated and governed by the laws of the Federal Republic of Nigeria.

With effect from the Start Date, the Seller shall sell and make available for delivery the Contract Quantity to the Buyer during the Delivery Period (5 years minimum renewable), and the Buyer shall take delivery of and shall pay for Coal or shall pay for Coal if not taken delivery of, in accordance with this Agreement.

The Buyer covenants that the Coal shall only be used as fuel for the production of power and for auxiliary services at the Buyer's Facilities (if any) in the Free Trade Zone at 9th Mile Corner, or in the event the Buyer's Facilities cannot take such Coal, the Buyer may use such Coal as fuel for the production of power at the power plant.

2.2.1.8 Electric Connection Agreement (ECA)

The Electric Connection Agreement (ECA) is established between the XENERGI LTD and each business operating within the free trade zone, including each residential, commercial and industrial property that need power to operate.

This agreement sets out the terms and conditions of connection to XENERGI's Distribution Network System in Compliance with applicable laws and relevant rules of the Free Trade Zone.

2.2.1.9 Loan Agreement (LA)

The Loan Agreement is between the lending bank (EXIMBANK SR), the Reimbursement Guaranteeing Bank (Buyer's Bank), the Exporter or Local Supplier and the Buyer. It sets out the terms on which the money is being lent, when it has to be repaid and at what interest rate. It will also contain certain conditions, which have to be fulfilled before any money can be drawn from the loan. These preconditions include amongst other things requirements such as confirmation of the exporter or Local Supplier that has received the direct payments from the buyer, any guarantees required have been obtained and that satisfactory legal opinions as to the validity of the contractual arrangements have been provided.

2.2.2 PROJECT DEVELOPMENT AND IMPLEMENTATION DOCUMENTS

2.2.2.1 Project feasibility study

The purpose of the Feasibility Study (FS) is to determine whether the objectives (techno-economic) of the Client are likely to be achieved. Objectives often involve the provision of services in a cost-effective manner, along with other operational, financial and social criteria. The feasibility has to answer the Crucial Question:" will this Project work?"

For the development of this Project, the feasibility study concept is illustrated in Fig 2-1 below. The Figure depicts the following elements:

- Stakeholders concerns;
- Coal to Power Project productivity;
- Market characteristics;
- Proposed development

The First three elements define the constraints within the proposed development must function and the opportunity it has to exploit. Jointly these three elements determine the context of the feasibility problem. The fourth elements: proposed development is a potential solution to this problem. The degree to which it is likely to succeed is evaluated through feasibility analysis.

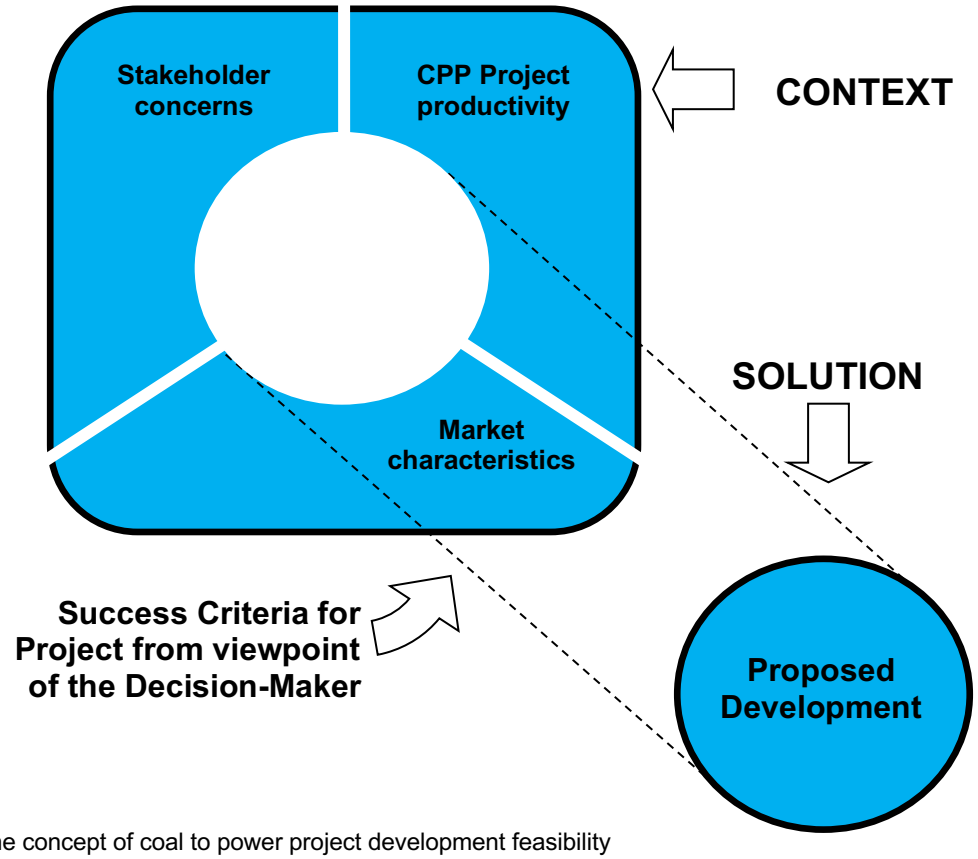

Fig 2.1 – The concept of coal to power project development feasibility

Description of the feasibility study context

- The stakeholders include the Developer, EPC contractor, Project Owner, Financiers, Guarantors or insurers, State and Federal Governments, intended Beneficiaries, Broader Public, Customer, Local Authority, Political Interests and Environmental Groups. Ideally, every Stakeholder's concerns with the Project should be addressed. Although feasibility is primary measured in relation to the objectives of the client, the success criteria for the proposed development have to interpret these multidimensional and often conflicting objectives in evaluating project feasibility.

- The Productivity Analysis of the IGCC Project is the simplest part of the feasibility study and entails determining what services the Project is capable of providing. This ends with an analysis of whether the proposal will allow the Project to attain its highest and best use, or most likely use. For the existing coal transportation infrastructure (roads, railways and waterways), investigating the access roads and distance to the Project site, deforestation of the related areas would be a good starting point. For the construction of the power plant, investigating the availability and location of fuel, including the method of evacuation of the generated power (*i.e*. embedded or to transmission lines or distribution networks are good starting points to accurately optimise cost and techno-economically achieve viability.

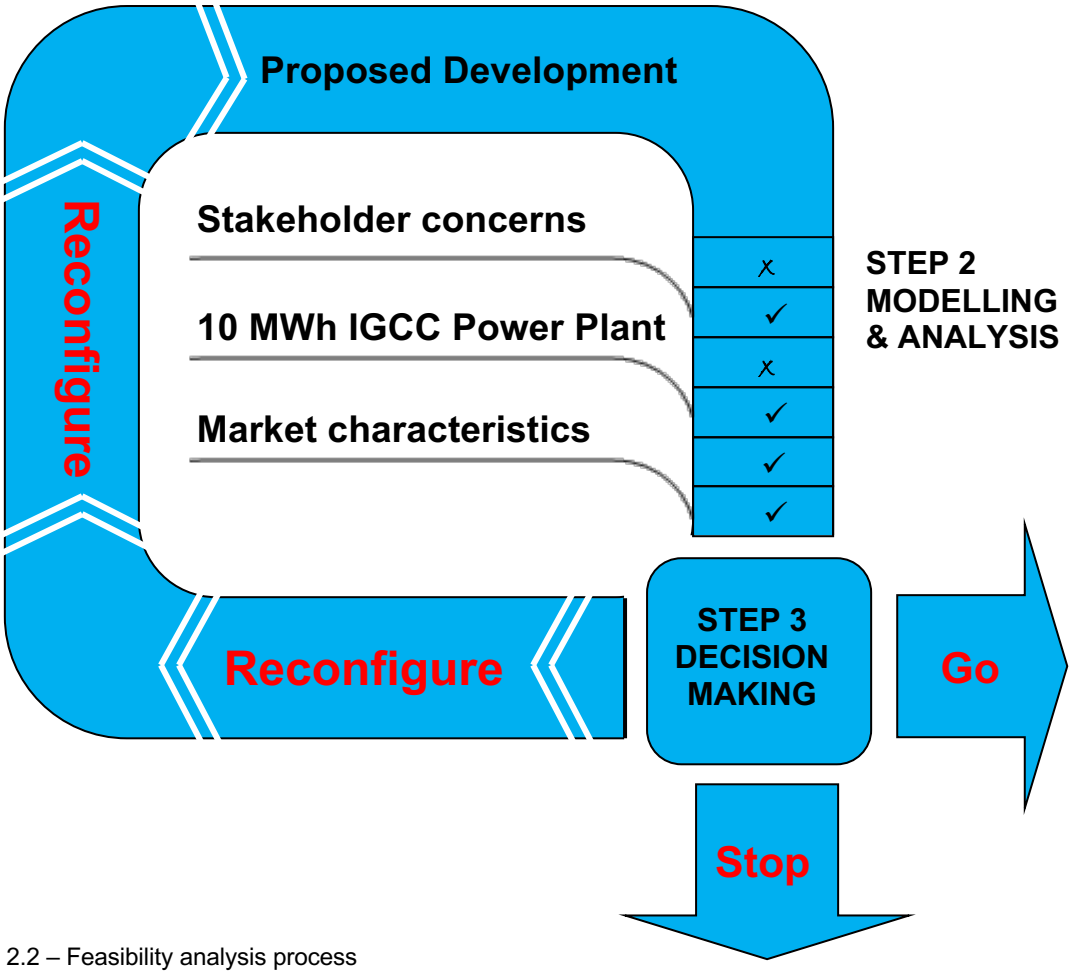

Fig. 2.2 – Feasibility analysis process

- Market Analysis is the most difficult part of the feasibility analysis and is usually the part that is executed poorly. But in our case, there is a huge existing market with a high and urgent demand of electricity. The market for the generated power is the Free Zone Enterprises and Companies. According to **XENERGI LIMITED**, there are already more **than 1,800 shop owners** who are ready to locate in the Free Trade Zone and sign the Connection Agreement with an average fix deposit of **US$100 (One Hundred US dollars)**. Power is a very precious commodity in Nigeria, where there almost an absence of regular power supply. Most of the Nigerian businesses are not operating successfully due to lack of power supply. The clientele is composed of Residential, Commercial and Industrial properties. Market analysis usually progresses from the general to the specific and includes broad economic and regional trends; supply and demand and potential opportunities; selling rates; and turnover estimates; and projection into the future. Market response is central to determining whether the objectives of stakeholders are likely to be achieved.

  The feasibility Analysis Process is depicted in Fig 2.2. As shown, the progress has three stages: Information gathering; modelling and analysis; and decision-making. During the feasibility analysis process, a custom-built decision model is used to evaluate the information that was gathered. The proposed development is systematically tested against each dimension of its feasibility context, using the success criteria of the Client. These criteria reflect the Client's requirements and its interpretation of the other stakeholders' concerns. Such systematic testing helps to establish whether the Project is likely to succeed. The process culminates in a recommendation to proceed with the Project, or to redesign the Project to more closely fit its problem context.

  The feasibility reports have no standard form, but are similar to other business reports. A typical report will describe and interpret the problem; describe and analyse the information gathered to solve the problem; and describe the custom-built decision model used to evaluate the likelihood of success. The report ends with a recommendation on whether the Client should proceed or not, or whether the development proposal should be modified, and in which respects. Reports usually have several appendices with maps, schedules, contract and other data of a detailed nature that would disrupt the flow of logic if placed in the main report. An executive summary is standard.

Evaluation of the feasibility study

In essence, a feasibility study that concludes that a project will "work" should convince the reader that the conclusion is appropriate to the data and analysis that have been presented. For the purpose of this Project, there are four other matters that may easily be checked.

The simplest is whether conclusions have been cross-verified, using alternative decision models that employ different input data. One industry standard approach is using "front door" calculation, to analyse the feasibility problem from opposing starting point. The two approaches should lead to similar but necessarily the identical conclusion about the feasibility.

The most common error in feasibility report is included data that is interpreted and that does not contribute to the conclusion. It is easy to check for such “boiler plate” text, especially in appendices. Every item of data in the report should contribute to one or more of the conclusions. A better way to assess the feasibility report is to draw a diagram of the logic that leads to the conclusions. An example of such logic diagram for determining the feasibility of developing energy and power projects is shown in Fig 2.3 below. Notice how every item of data required to reach the conclusion on justified investment is logically tied together. In the report you read, every item of data should be employed in the decision model and its effect on the eventual recommendation should be evident. If the logic diagram cannot be drawn from a report, the logic is flawed and the author’s competency is suspect. Examples of reports with such a smoke-and-mirrors style of argument abound. If a data item is qualitative, its effect should be evaluated formally, using techniques such as the Analytic Hierarchy Process of Repertory Grid.

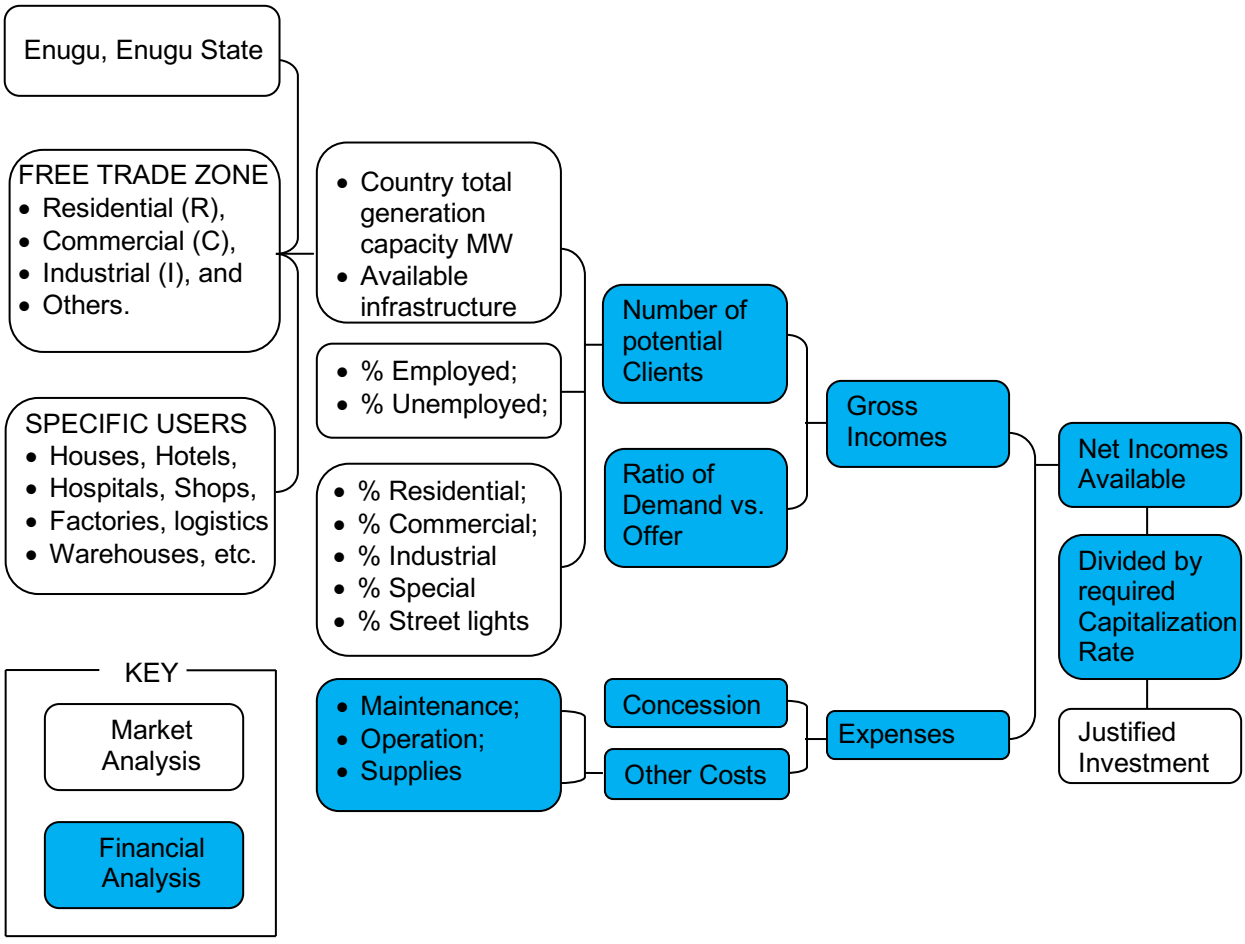

Fig 2.3 – Determination of justified investment

A third check is whether the conclusions are conservative. For example, a simple way of making an infeasible Project appear acceptable is to increase the projected growth rates or the expected absorption rate. Such unprofessionally executed studies are cynically referred to as “opportunity studies” that merely endorse the enthusiasm of the Project sponsors. As long ago as 1958, Richard Nelson said: “the good analyst will present a conservative report based, if there are unknown quantities, upon minimum assumption” Overoptimistic feasibility analyses, with inappropriate recommendations on Project scale

or orientation, are major causes of failure in electric energy development Projects. A electric energy development feasibility analysis should rather err on the conservative site and avoid telling the Client what he/she would like to hear. It is not pleasant to tell a Client that a pet project is likely to succeed. Such a conclusion effectively precludes the possibility of future consulting fees on the Project. But it should be done this is the most supportable conclusion. The author of a feasibility study can be held accountable for a recommendation if it was derived in an unprofessional manner.

And, how should the feasibility consultants be evaluated? They should have specialist training in energy, energy resources and Power, especially in feasibility analysis, and they should have professional registration in the Electric Energy Industry. One signal that the consultant is doing less than what is required is the use of so many qualifying statements that, in effect, no liability is accepted for the conclusions. Another signal is when the study is named anything other than a feasibility study. Referring to a study as a "financial feasibility study" or an "economic feasibility study" may be an attempt to side step part of the central question: "Will this Project work?"

Checklist for evaluating a feasibility study report

The Feasibility Study report of the Project shall include the following main sections:

A) FEASIBILITY OBJECTIVES:
   - Client objectives and constraints defined?
   - Other stakeholders and their objectives identified?
   - Development proposal clearly described?
   - Working definition of what constitutes feasibility for this Project?

B) COAL TO POWER PRODUCTIVITY ANALYSIS:
   - Physical characteristics?
   - Project location characteristics?
   - Legal characteristics?

C) MARKET:
   - Economic circumstances and trends brought into direct relation to Project?
   - Target market identified?
   - End user demand quantified?
   - Tenant demand quantified?
   - Competitive supply quantified?
   - Supply and demand comparison to identify market gap?
   - Absorption rate specified?
   - Property occupancy or vacancy forecast?
   - Turnover forecast?
   - Rental income forecast?
   - Realistic growth projections?
   - Conservative estimate of economic multiplier effects?
   - Correct scale of development in relation to its realistic market?

D) SAMPLE DATA
   - If primary research: is sample frame specified?
   - If primary research: is sample a proper random (not convenience) sample?

- If desk (secondary) research: was originator's research methodology verified?

E) MODELLING
- Analysis thorough and can be diagrammed?
- Financial analysis realistic and comprehensive?
- Alternative calculation models to cross-check the conclusion?
- Sensitive analysis to reveal impact of different scenarios?
- Conservation in choice of input data and in interpreting results?
- Qualitative aspect of Project formally evaluated?

F) CONCLUSIONS
- Explicit comparison of Conclusions with objectives of Client and Stakeholders?
- Conclusion and recommended course of action supported by the analysis?
- Clear go, no go, or redesign recommendation?
- Is the reader convinced by the argument?
- Risk and their potential impacts discussed?
- Fine-tuning suggestion to improve likelihood of success?
- Profiles of potential tenants drawn up?
- Profile of potential investors drawn up?
- Financing source and terms identified?

G) CONSULTANTS
- Formally trained in the property industry?
- Professional registration in the property industry?
- Experience of this type of development?

H) REPORT FORMAT
- Report is professional and does not rely on bulk to appear convincing?
- Appropriate appendices to support the report?
- No unprofessional qualifying statement and limitation of liability by the author?

Conclusion

After reading a report that recommends that a development should proceed, the Client should be convinced it will succeed, not because it would be nice to have, but on the basis of hard facts, convincingly presented and cross-checked, using industry-standard approaches. If the Client is not certain, he/she should obtain the services of a specialist to verify the study.

The Development and implementation of the Coal to Power Project will also involve the Evacuation Studies by the Transmission Company of Nigeria (TCN).

NOTE
The economic analysis for all new or modified plant construction projects shall consider all suitable alternative methods to determine the most cost-effective method of accomplishment.

2.2.2.2 Detailed technical designs

For the purpose of this PAM and technoeconomic studies, the detailed technical designed shall consist of the construction site layout (3D and 2D designs) and the detailed technical designed of the main equipment of the power plant.

2.2.2.3 Project Environmental Impact Assessment (EIA)

An environmental impact assessment (EIA) is an assessment of the possible impact – positive or negative – that a proposed project may have on the environment, together consisting of the natural, social and economic aspects.

The purpose of the assessment is to ensure that decision makers consider the ensuing environmental impacts to decide whether to proceed with the project. The International Association for Impact Assessment (IAIA) defines an environmental impact assessment as "the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made."

After an EIA, the precautionary and polluter pays principles may be applied to prevent, limit, or require strict liability or insurance coverage to a project, based on its likely harms. Environmental impact assessments are sometimes controversial

Before the start of any work at any site of the zone, the Developer's experts (geologists) have to carry out a preliminary study called **Geologic Reconnaissance Report (GR)**, which is always required for the evaluation of the level of risk due to the suspected geologic hazard that can be mapped at the site. This report generally includes a visit to the site and a review of available records, maps, and photographs that might provide information about the geotechnical conditions at the site.

The geotechnical Study identifying the **Seismic Safety Conditions**, and Soils Test Data of the construction site shall require some level of evaluation by a State licensed geologist or Civil Engineer, or both shall also be performed. An initial geotechnical investigation shall be conducted to evaluate existing site conditions in order to obtain general soil and stability information.

Another report hereinafter called **Geotechnical Investigation Report (GI)** shall also be done. When there is a higher risk, such as when a fault or landslide is suspected nearby or when the reconnaissance finds evidence of a significant hazard on the site, a GI shall be required. The investigation would include fieldwork, such as trench excavations and/or borings, geologic mapping, soil samples, laboratory analysis, and a thorough evaluation of all encountered geotechnical hazards.

Project Environmental Impacts

The environmental benefits associated with the establishment of the proposed Project in 9th Mile Corner, Enugu, Enugu State can easily be estimated by determining the reduction in the production of air pollutants associated with this Project. It is our belief that this

Project represents an excellent solution for meeting Nigeria's looming standardized Power Plants challenge.

The Project facilities shall be designed to produce minimal noise and emission; and shall take up significantly less square footage. That is the reason why the Project's policy requirement will not allow any use of generator within the whole developing zone (the EEL's Free Trade Zone).

The Project must have long-term flexibility to adapt to the surroundings. The Project facilities and sites shall be maintained and landscaped to be consistent with the Promoters' vision to develop this Nigerian Power Sector.

Community Considerations

A number of steps shall be taken to ensure positive outcomes for the local community as well. These include:

- Constructing the Project to ensure that noise under normal operating conditions does not at specific locations exceed 45dBA – which is equivalent to the sound of rustling leaves;

- Installing Continuous Emissions Monitoring systems and reporting results annually to the State Ministry of Environment; and

- Continuing with providing information to the public and creating a volunteer Community Liaison Committee.

A regular discussions with the community regarding the project shall be scheduled and have a full time person dedicated to community liaison.

Public Support

A campaign must be launched to inform people why this Project, contributing in reducing poverty, unemployment, would benefit their needs. Surveys should show that two out of every three from four inhabitants (cca 75%) support the idea of increasing the live standard of the people of Enugu State and Nigeria.

Nigerian Emission Limits

There are no emission limits, especially applicable to Power Plants (Biomass, Hydroelectric, Solid ad liquid wastes Power Plants, etc.) in Nigeria. The general limits are given in some cases and the choice of applicable limits is based on socio-economic and political condition. (Ref: Guidelines and Standards for Environmental Pollution Control in Nigeria, Federal Environmental Protection Agency (FEPA) 1991.). Those of potential interest to this Project are:

- Carbone dioxide (CO_2) from stationary sources 10% by volume; and

- Oxide of Nitrogen (NOx) from stationary sources: 359 ÷ 1,000 mg/m^3.

The site CO_2 emissions are expected to be approximately 3% by volume and NO_2 emissions are expected to be more than 50 mg/Nm^3 (Nm^3 is a cubic meter of a dry sample of as normalized to 15% of O_2 at 279 K and 1atm)

Air quality

This Project emissions of air pollutants such as nitrogen oxide (NOx), sulphur dioxide (SO_2) and carbon monoxide (CO) shall not violate ambient air quality standards and the air quality impacts from these emissions of the project shall be insignificant. The project's air quality impacts from directly emitted particulate matter (PM) and of the ozone precursor emissions of NOx, volatile organic compounds (VOC), and PM precursors of NOx and SO_2 shall be reduced and monitored by using Best Available Control Technology, and will provide emission offsets for their NOx, VOC, and PM emissions. These mitigation measures reduce the potential for impacts (including cumulative impacts) from directly emitted PM_{10}, as well as ozone and secondary PM formation to a level of insignificance.

Material and Environmental Compatibility

Materials issues are at the heart of any mechanical design, and in the case of the aforementioned Projects, should be considered with respect to the environment, and lifetimes of each of the Projects systems. These issues should not be complicated because the systems will be installed in the same location with similar conditions. Principal concerns are associated with corrosion, in hot, humid and salt air climates.

Checklist for evaluating an Environmental Impact Assessment report

The Project Environmental Impact Assessment Report shall focus on the following seven key areas that are required for a sustainable development of the Project:

A) DESCRIPTION OF THE PROJECT
   - Description of actual project and site description;
   - Break the project down into its key components, i.e. construction, operations, decommissioning;
   - For each component list all of the sources of environmental disturbance;
   - For each component all the inputs and outputs must be listed, e.g., air pollution, noise, hydrology; what are the type of components or systems that generates noise and pollution?

B) ALTERNATIVES THAT HAVE BEEN CONSIDERED
   - Examine alternatives that have been considered;
   - Example: in a biomass power station, will the fuel be sourced locally or nationally?

C) DESCRIPTION OF THE ENVIRONMENT
   - List of all aspects of the environment that may be effected by the development;
   - Example: populations, fauna, flora, air, soil, water, humans, landscape, cultural heritage;

- This section is best carried out with the help of local experts;

D) DESCRIPTION OF THE SIGNIFICANT EFFECTS ON THE ENVIRONMENT
- The word significant is crucial here as the definition can vary;
- 'Significant' needs to be defined;
- The most frequent method used here is use of the Leopold matrix;
- The matrix is a tool used in the systematic examination of potential interactions;
- Example: in a windfarm (power plant) or Airport development a significant impact may be collisions with birds.

E) MITIGATION
- This is where EIA is most useful;
- Once section D has been completed it will be obvious where the impacts will be greatest;
- Using this information ways to avoid negative impacts should be developed;
- Best working with the developer with this section as they know the project best;
- Using the windfarm example again construction could be out of bird nesting seasons.

F) NON-TECHNICAL SUMMARY (EIS)
- The EIA will be in the public domain and be used in the decision making process;
- It is important that the information is available to the public;
- This section is a summary that does not include jargon or complicated diagrams;
- It should be understood by the informed lay-person.

G) CONSULTANTS
- Formally trained in the Environment Impact Assessment?
- Professional registration with the Federal Ministry of Environment?
- Experience in the field of environmental issues?

H) REPORT FORMAT
- Report shall be professionally carried out and shall not rely on bulk to appear convincing?
- Appropriate appendices to support the report?
- No unprofessional qualifying statement and limitation of liability by the author?

I) LACK OF KNOW-HOW/TECHNICAL DIFFICULTY
- This section is to advise any areas of weakness in knowledge;
- It can be used to focus areas of future research;
- Some developers see the EIA as a starting block for good environmental management.

2.2.2.4 Conclusion

Each element of the power plant Project, Coal, Integrated Wastewater Treatment Plant, Road Network, Sewerage Canalization, Coal Convey Belts or Coal Storage Area, Electric

Distribution Substation, etc. shall be integrated in the Environment Impact Assessment Report, including geotechnical studies.

2.2.2.5 Evacuation studies for extra generated power

The evacuation of the generated power from the power plant to the consumers shall be carried out pursuant to the rules and regulations of the Transmission Company of Nigeria (TCN), Power Holding Company of Nigeria (PHCN) and the Nigerian Electricity Regulatory Commission (NERC). Pursuant to TCN requirements, a generated capacity higher than 200 MW shall be interconnected to a nearby existing 330 KV transmission lines. In our case, the generated electric energy by the 10MWh IGCC power Project shall be only used for the purpose of embedded power for the EEL's Free Trade Zone. The extra-generated Power will be sold to the neighbouring residential, commercial and industrial facilities located within a radius of 30 km from the power plant.

An Evacuation Study to investigate the ability of the Transmission Grid Networks to evacuate the entire power output from the proposed IPP Power Plant set against the generation background as advised by TCN and agreed forecast demand for short, medium and long terms shall be carried out. This study must include among other things:

a) Feasibility of connecting the proposed IPP Power Plant with its own integrated Electricity Distribution Network assuring the supply of Captive Power its own clients, which are located within the Free Trade Zone and within a radius of 30 km;

b) Perform load flow studies to determine the required system reinforcements. The studies must indicate that the unconstrained evacuation of the proposed 10 MWh IGCC power plant in the Free Trade Zone will be secured by implementation of some levels of distribution system reinforcements;

c) Perform transient stability studies to assess system stability;

d) Perform fault level studies to determine the distribution system fault levels at 33kV, 11kVand 0.4kV switchgear ratings are not exceeded;

e) Perform reactive compensation study on transmission system in order to define, locate and size the most appropriate reactive compensation equipment in the network;

CHAPTER III: PROJECT DESIGN & CIVIL WORKS REQUIREMENTS

3.1 INTRODUCTION

The sites design of the Project shall have a strategic and structured development process to avoid disorder and chaos during implementation (construction) and operation. This design shall methodically lay emphasis on the followings:

- Overall site Development Concept, site organization, Location of Facilities and nature of site improvements;
- Vehicular Access and Movement, External Road Network, Access and Internal;
- Distribution (good, electricity, telecommunication and road networks, etc.);
- Parking Arrangement and Provisions;
- Pedestrian Movements;
- Site Infrastructure Systems:
  - ✓ Foul Water Drainage System
  - ✓ Storm water Drainage
  - ✓ Fresh Water Supply
  - ✓ Irrigation Water Supply
  - ✓ Fire Main Services
  - ✓ External Power Distribution
  - ✓ Telecommunication Cable Intake
- Environmental Impact Statement;
- Site Area Analysis, to indicate the total area *(and percent to total)* in each land use.

This design of each Project to be implemented within the provided developing zone shall include the architectural, structural, mechanical, electrical, quantity and quality surveys.

3.2 DESIGNS DEVELOPMENT

3.2.1 ARCHITECTURAL DESIGN

The architectural design consists of the following part of each construction site:

- Floor plans, elevations and sections with appropriate labelling;
- Schedules, Material Selections, Finishes, Equipment layout and fittings designations;
- Sketches indicating architectural treatments;

- Perspective Drawings to show overall architectural character and style;
- Space analysis *(net to gross ratio)* supported by floor area calculation sheets.

3.2.1.1 Interior Design

- Definitive Occupancy layouts by floor
- Fixed Furnishings and furniture layouts
- Interior Finishes and Design Development
- Way Finding Systems
- Graphics treatment
- Interior Landscape
- Art Work Location

3.2.1.2 Landscape Design

- Landscape Development Concepts
- Site Levels, Grading and Earth Mounding
- Soft Landscape Zones:
  - ✓ Plant Strategy
  - ✓ Plant species and sizes
  - ✓ Irrigation Requirements
- Hard Landscape Zones:
  - ✓ Interim Roads
  - ✓ Walkways
  - ✓ Planters
  - ✓ Site Furnishings
- Special Elements:
  - ✓ Water features
  - ✓ Shade structures

3.2.2 STRUCTURAL DESIGN

- Structural system layouts and sections.
- Live and dead loads, wind loads and indirect bomb blast loads.
- Structural materials, allowable stresses, applicable design codes and methods of analysis;

- Permissible drift for lateral forces;
- Type of construction of frames, roofs, walls and floors;
- Foundation design including permissible different settlement and type of protection to be used against surface and sub-surface water;
- Expansion joints, construction joints, tanking details, lift core pits, sump pit trenches, etc.

3.2.3 MECHANICAL DESIGN

- .Air Conditioning Systems;
- Ventilation Systems;
- Mechanical Plant;
- Fire and Smoke Control;
- Energy Conservation;
- Drainage Layouts;
- Water Supply Layouts;
- Water Riser Diagram;
- Fire Protection System.

3.2.4 ELECTRICAL DESIGN

- Electrical System Layout
- Lighting Layout
- Telecommunication and Data System Layout
- Security System Layout
- Recommended energy conservation measure as agreed by the Ministry of Electricity and Water.

3.2.5 SPECIAL SYSTEMS

- Fire Fighting System (*alarm, alternative of Halon protection and Sprinkler Systems)*

- Mechanical Transport System
- Building Management System
- System Integration
- Audio-Visual Systems
- Other Special Systems as may be appropriate

CHAPTER IV: PROJECT TASKS SCHEDULING

4.1 INTRODUCTION

Generally the work required for this type of Project can be divided into sequential stages outlined as follow:

Stage 1: Development Phase (Basic Services)

- *Data Collection* and Project Program
- *Master Planning* and Design Alternatives
- *Design Development (Basic Design and Final Design)*

Stage 2: Implementation (Additional and Optional Services)

- *Construction/Installation*
- *Test*
- *Commissioning*

During the course of Stage 1, the following additional tasks and services may be required:

a) Furniture Design for the Administration Building, Workshops, etc.
b) Special Equipment Planning *(i.e. Medical or others,)*

Subject to the Instructions of the Project Developer, one *(or more)* of the following *Optional Services may also be required:*

a) Value Engineering Workshop(s)
b) Reference Handbook (laboratory, management, etc.)
c) Training Program
d) Study Tour

4.2 PROGRESS OF WORKS

4.2.1 SUPERVISION AND MONITORING

The purpose of project monitoring is to identify and resolve any problems occurred during project implementation. Project monitoring is based on information about project progress (i.e. inputs, activities and outputs, compared to implementation schedule).

Efficient monitoring is based on a permanent co-operation between the Developer, the Project Company, the state government, the experts, the managers, and the beneficiary(ies). The exchange of information occurs through telephone, fax, workshops, site visits, etc.

Periodically (e.g. every month) the Lead Consultant prepares a Progress Report and submits it to the Developer. The table of contents of the Progress Report to be prepared is presented below.

Project monitoring should already be considered at the stage of project approval. The Implementation Agreement shall, at least, identify the parties responsible for the project reporting system and also the Table of Contents and frequency of reports.

Progress Reports are important instruments of project monitoring. They provide an opportunity for the beneficiary(ies) to ask the Developer for assistance in solving problems that are out of the control of the beneficiary. In the Progress Reports the beneficiary may propose changes in implementation schedule (if need be).

In this context it is important to keep in mind that the Developer and the beneficiary(ies) share the responsibility for successful project implementation and problem resolving.
The Developer's experts may, after having studied the Progress Reports, conduct site visits and obtain additional information to:

- ensure that the beneficiary(ies) operates within the conditions laid down in the Implementation Agreement;
- identify problems and assist in solving these; and
- close down a project if its further implementation is not justified, particularly if the beneficiary(ies) violate the conditions laid down in the Implementation Agreement.

The Developer's experts should be encouraged to establish and maintain confident relations with the beneficiary, so that the beneficiary does not hesitate to inform the Developer about problems occurred.

4.2.2 PROGRESS REPORTS

Reports shall be written on A4 paper size.

Daily and Monthly Progress Reports shall be prepared and submitted by the Lead Consultant to the Project Developer.

Reports shall identify progress on work tasks, estimated completion date of tasks, issues and problems which surfaced during the reporting period, proposed actions to remedy identified problems, and upcoming events, milestones and meetings during the forthcoming month.

With the Progress Report, the Lead Consultant shall also submit a revised project schedule for approval, if for any reason, the milestone dates have changed.

Design Monthly Progress Report shall consist of:

- *Progress on Work Tasks*
- *Issues and Problems*
- *Upcoming Events, Milestones and Meetings*

The Monthly Progress Reports shall include the following key points:

A) KEY DATA (MAXIMUM 1 PAGE)
- Project title;
- Name of beneficiary (and applicant in case the beneficiary is different from the applicant);
- Name(s) of sponsor(s);
- Reporting period.

B) PROJECT OBJECTIVES (MAXIMUM 1 PAGE)
- Assessment of the probability of achieving the project objectives.

C) PROJECT OUTPUTS (MAXIMUM 2 PAGES)
- Project outputs achieved since project start (summary only);
- Project outputs achieved in reporting period;
- Indication of whether project outputs are achieved in accordance with project implementation schedule

D) PROJECT ACTIVITIES (MAXIMUM 10 PAGES)
- Project activities carried out since project start (summary only);
- Project activities carried out in reporting period;
- Project activities to be carried out in next reporting period;
- Indication of whether project activities are carried out in accordance with project implementation schedule.

E) MAIN PROBLEMS (MAXIMUM 2 PAGES)
- Major problems that are considered to be serious constraints for successful project implementation;
- Indicate recommended actions to be taken in order to solve identified major problems.

F) FINANCIAL STATUS (MAXIMUM 10 PAGES)
- Actual spending to date by beneficiary(ies) ((and applicant in case the beneficiary is different from the applicant), sponsor(s) and dactual spending Developer to date by activities;
- Actual spending by man-power costs, procurement of equipment with a lifetime more than one year and other reimbursable (e.g. travel costs, printing and communication).

4.3 PROJECT KICK-OFF AND DATA COLLECTION

The objectives of this phase 1 consist of producing a definitive design brief and Project Program based on data collected and analysed during Phase 1.

4.3.1 REQUIREMENTS GUIDELINES

- The Developer shall undertake site investigations, contact the relevant State Government Authorities to obtain a better understanding of the Project needs and

analyse *existing facilities within the developing zone in order to validate the schedule of requirements as outlined.*

- The Developer shall contact the relevant Enugu State Government Authorities to obtain relevant data related to the Project and to determine the location, availability and capacity of public facilities and services.

- The Project Company and other Governmental Agencies shall assist the Developer in obtaining the available relevant information related to the project. It shall be the responsibility of the Developer to collect and collate such information and verify its accuracy.

- All data collected, computer printouts, the results of analysis, studies and findings shall be fully documented and presented to the Developer before being transferred to any Contractor and/or Supplier.

4.3.2 DATA COLLECTION

- *Data collected shall include but not be limited to:* Survey of all existing buildings and facilities *(if any)* within the site boundaries.

- Preparation of base map(s) showing site boundaries, peripheral land uses, topography, surrounding circulation networks and site accessibility, existing site features such as trees and buildings and utilities including location, size and capacity of sanitary sewers, storm sewers, power supply, water lines *(fresh and brackish),* coal convey belts (*if any*), fire protection system, and telephone lines.

- Survey of environmental conditions such as subsoil conditions and constraints, depth to ground water, areas subject to flooding, noise *(including flight patterns)* existing vegetation, wind direction and solar design constraints.

- Survey of existing and projected pedestrian and vehicular traffic flows, car parking distribution, public transport operations, and emergency and service routes.

- User Agency organization chart clearly showing organizational framework and hierarchy.

- Survey of the User departmental operation procedures and the interdepartmental Relationships.

- Review and validation of the project's specific population needs including administrative and service personnel, as well as those needs of the principal users of the facility.

- Review of all applicable State and Federal regulatory requirements.
- Review of all applicable cost and financial data.

4.3.3 DATA ANALYSIS

The product of Phase 1 shall culminate in a *DATA COLLECTION* and *PROJECT PROGRAM REPORT.* This report shall include, but is not limited to the following:

- An analysis of the collected information, i.e. regulatory, physical, financial, environmental, traffic, parking, utility and demographic opportunities and constraints and their effects upon the design process and intent.

- An analysis of the purpose of the project, including a clear statement of goals and more specific objectives.

- An Environmental Impact Statement (EIS) for the project that is consistent with the international guidelines for EIS preparation. A typical EIS identifies existing site conditions and potential project impacts on environmental resources, and then provides a description of the means to minimize, mitigate and avoid potential adverse impacts.

- Space analysis, including standards and requirements for each category of user function.

- All maps, charts, graphs, matrices, sketches and similar graphic material necessary to provide a clear understanding of the above analysis.

- Project Delivery Approach to recommend on the most effective means for organization and delivery of the project.

- Project Program and Definitive Design Brief.

4.4 MASTER PLANNING AND DESIGN ALTERNATIVES

The objectives of this phase consist of illustrating and testing various possible alternatives, leading to secure the best practical solution for the project.

4.4.1 REQUIREMENTS GUIDELINES

- The Developer shall develop *THREE* distinct architectural studies and appropriate site plans which take into account the data analysis gathered in Phase 1 and the Project Program.

- It is emphasized that each of the three conceptual studies will address architectural form, character and space relationships that are unique to that particular study alternative.

- The Developer shall review the analysis of Consulting and the Sub-consulting companies and respond with comments. To reduce the possibility of rejection, interim discussions with main Project entities early in the development of Phase 2 for the purposes of guidance and direction, is required.

- If none of the three conceptual designs is approved, the Developer shall incorporate the suggestions of the main Project Entities and promptly resubmit new conceptual designs.

- The Developer shall not proceed to Phase 3 until an approved conceptual direction is established and approved.

4.4.2 REPORT

The product of Phase 2 shall form the basis for the *CONCEPT DESIGN ALTERNATIVES REPORT.* The report shall include but not limited to the following elements:

- A Development Control Master Plan with appropriate Time Scale.

- Organization plans in the form of spatial relationship diagrams.

- Conceptual site plan, with diagrammatic indications showing relationship of Project components.

- Conceptual site and landscape plans.

- Conceptual traffic plan, to include vehicular, pedestrian, service, public safety and parking arrangement pursuant to the Nigerian – Laws of Regulations and Safety (LORS).

- Conceptual building plans, single line drawings with all areas labelled.

- Conceptual elevations showing architectural treatments.

- Conceptual sections.

- Volumetric character sketches and Perspectives.

- Block model(s), for each of the three concepts.

- Conceptual Engineering Systems.

- Cost estimate for each alternative, in accordance with this *Project Estimating Requirements of Nigeria/EU.*

- Space analysis *(net to gross rations etc.)* in accordance with the PERM of Nigeria/EU

- Cost saving recommendations in accordance with the *Project Estimating Requirements of Nigeria/EU.*

- Evaluation criteria of the three alternative concepts and recommendations of the Lead Consulting Company. *(Without final grading or scoring).*

4.4.3 DELIVERABLES OF PHASE 1 AND PHASE 2

The Lead Consulting Company shall refer to the *"SCHEDULE of SUBMITTALS"* for the specifics and requirements of the deliverables for Phase 1 and Phase 2. (Pre-feasibility Studies, Feasibility Studies, Environmental Impact Assessment Report, etc.)

4.5 DESIGN DEVELOPMENT

The purpose of the Design Development Documents is to fix and describe the size and character of the entire Project and such other essentials as may be appropriate.

4.5.1 REQUIREMENTS GUIDELINES

- The end product of this phase shall consist of three parts:

  a. Complete Design Development Drawings for the Selected Concept
  b. Design Development Report.
  c. Preliminary Model.

- The recommended approved alternative design, from Phase 2 shall be further refined to form the Design Development Documents, which when approved shall form the basis for the Construction Documents.

- An interim review shall be scheduled during the midpoint of the Design Development Phase to review facilities layouts, massing, equipment and systems.

- This Phase will result in a formally submitted Design Development Report to Supplier and/or Contractor for review and approval. The report should include as list of all required approvals other relevant government ministries and agencies.

- The report shall address the required elements with narrative and graphic materials as appropriate. Included in the narrative portion shall be a description of approximate dimensions of structural components, engineering/architectural materials, claddings, equipment, volumes and capacities. Also included in the report shall be prioritized construction implementation schedule, including on and off-site infrastructure, buildings and site works.

4.5.2 REPORTS

DESIGN DEVELOPMENT REPORT shall include, but not necessarily limited to the following:

- **Design Specifications.** The specifications for various Architectural and Engineering Disciplines shall be prepared in the European and Nigerian Standards.

- **Cost Estimate.** Preliminary cost estimate;

- **Material Report.** Specifying the criteria and grade quality standards (EU, CCS, …) of the Project; and

- Architectural finishes for exteriors and interiors with sample boards, where appropriate.

4.5.3 SYSTEM ANALYSIS

- To establish the Engineering Systems criteria and quality standards to the Project.

- It is to be achieved by factors such as energy conservation, value engineering and life cycle costing to select, from a predetermined set of optional approaches, the best engineering systems for the project. Analysis of the proposed building and engineering system in relation to existing Nigerian/EU Building codes and regulations.

- To confirm the availability of materials at source by suppliers, at the sizes, quantities and rates of production required by the Projects Construction Schedule.

4.5.4 IMPLEMENTATION

- Review and update previously established schedules for the project.

- Project delivery procedures

- Construction sequencing and scheduling

- Statutory Authority Approvals

4.5.5 PRELIMINARY MODEL

The Consulting Company shall present a mode of the Developed Design (Plant Technology and Civil Object).

The area shall replicate the area required in the site plan. The scale of the model shall be 1:500 or as determined by mutual consent between the Developer, Supplier and/or Contractor prior to the commencement of Phase 4.

4.5.6 DELIVERIES

The Consulting Company shall refer to the *"SCHEDULE of SUBMITTALS"* for the specifics and requirements of deliverable for Phase 3.

4.6 WORKING DRAWINGS

This phase consists of:

- producing the **Working Drawings** and **Specifications** that set forth the requirements for the Construction of the Project;

- preparing the bidding and contractual information for construction.

4.6.1 REQUIREMENTS

The Lead Consulting Company shall assist Developer to produce the Working Drawings and Technical Specifications based on the Working Drawing of the power plant Technology provided by Supplier and/or Contractor.

4.6.2 WORKING DRAWINGS OVERVIEW

- The approved products of Phase 3; shall be coordinated with the work of other disciplines to produce completely coordinated working drawings and specifications. These documents shall establish in detail the requirements for the construction of the entire project.

- All Final documents shall be dimensioned in the metric system, complete coordinated and fully detailed to the highest standards, using the required scales and Formats as instructed by Supplier and/or Contractor.

- An interim review shall be scheduled during the midpoint of the phase, to review progress and content of the work. Such review shall cover and include all Architectural and Engineering disciplines.

4.6.3 CONTENTS OF THE CONSTRUCTION SITE WORKING DRAWING DOCUMENTS

The Consulting Company shall prepare and submit to the Ministry for approval Final Design *WORKING DRAWINGS DOCUMENTS* to the required scales and/or Formats including the followings:

A. TITLE SHEET

B. DRAWING INDEX SHEET.

1) SITE DEVELOPMENT DRAWINGS
   - Existing conditions plan
   - Staging, Stockpile, Demolition / Removal Plan
   - Building Locations
   - Hard-landscape areas
   - Soft -landscape areas
   - Site lighting locations
   - Site Furnishings Locations
   - Site Construction Details
   - Site Grade and Drainage
   - Foul Water Drainage
   - Storm Water Drainage
   - Irrigation / Brackish Water
   - Fresh Water Supply
   - Fire Main Service

- Internal Road Sections and Details

2) ARCHITECTURAL DRAWINGS
   - Floor Plans, Sections and Exterior Elevations
   - Detailed Floor Plans
   - Reflected Ceiling Plans
   - Exterior Wall sections and Details
   - Interior Elevations and Details
   - Vertical Circulation, Stairs, Elevators, Escalators
   - Partition / Door / Finish Schedules
   - Special Areas Details

3) INTERIOR DESIGN
   - Occupancy Plans
   - Furniture Plans
   - Finishes Plans
   - Signage / Graphics Plans
   - Interior Landscape Plans
   - Art Work Location Plans
   - Interior Architectural Millwork

4) LANDSCAPE DRAWINGS
   - Site Planting Plan
   - Plant Locations
   - Plant Species
   - Irrigation Plans
   - Enlarged Area Plans
   - Special amenity areas
   - Hard-landscape / Soft-landscape details

5) STRUCTURAL DRAWINGS
   - Site Work
   - Framing Plans
   - Elevations, Sections, Details
   - Schedules
   - Special Design

6) MECHANICAL DRAWINGS
   - HVAC Floor Plans
   - HVAC Details and Schedules
   - Riser and Flow Diagrams
   - Automatic Control Diagrams
   - Drainage Layouts
   - Drainage Riser Diagram
   - Coal Storage and Supply Layouts
   - Water Supply Layouts
   - Water Riser Diagram
   - Schedules and Details
   - Fire Fighting Layouts

- Fire Fighting Riser Diagram
- Details and Capacity Schedules

7) ELECTRICAL DRAWINGS
   - Technology Installation Layouts
   - Power Installation Layouts
   - Lighting Installation Layouts
   - Communication System Layouts
   - Fire Alarm System Layouts
   - Security System Installation Layouts
   - Equipment Power Installations
   - Fixtures / Panels Schedules
   - Grounding System Schematics
   - Details

8) SPECIAL INSTALLATIONS
   - Technology (Turbines, boilers, pipelines, etc)
   - Telecommunication Systems
   - Fire Fighting System
   - Mechanical transport system
   - Office, Library and computer equipment details
   - Safety installations systems
   - Building automation systems
   - Audio / Visual Systems
   - Food service equipment (if applicable)
   - Medical Gases Systems (if applicable)

9) TECHNICAL SPECIFICATIONS
   - Complete Draft of the Technical Specifications shall be in ISO or Equivalent (for both technological and Civil Engineering parts)

10) MATERIALS / SAMPLES BOARD
   - Developer shall prepare and present materials sample Board, to include all the exterior Architectural Finishes of the Plant.
   - Developer may also be required to submit sample Board for the interior finishes of the Plant

.

11) LANDSCAPE / MATERIALS BOARD
   - Developer shall prepare and submit a Landscape materials sample Board to include photos or samples of the elements to be used for Landscaping.

12) AS TO-BE-BUILT MODEL
   - DEVELOPER shall prepare and submit "As to-be-built" Model scale 1:500 or as determined and approved by mutual consent between the Developer and the Supplier and/or Contractor.

4.7 SUPERVISION

4.7.1 SUPERVISION STAFF

As guide for the required supervision staff, the Consulting Company may consider utilizing the following List of Positions as a minimum:

4.7.2 SUPERVISION STAFF

4.7.2.1 Supervisory Staff

- The Developer shall have adequate staff on the site at all times to perform the supervisory responsibilities

4.7.2.2 Contract Administration

- Processing of submittals, including receipt, review of, and appropriate action on Shop Drawings.
- Product Data, Samples and other submittals required by the Contract Documents.
- Maintenance of master file of submittals.

4.7.2.3 Inspection Coordination

- Administration and coordination of field-testing required by the Contract Documents.
- Recommending scope, standards, procedures and frequency of testing and inspections.
- Arranging for testing and inspection of Owner's behalf.
- Notifying inspection and testing agencies of status work requiring testing and inspection.
- Evaluating compliance by testing and inspection agencies with required scope, standards, procedures and frequency.
- Review of reports on inspections and tests and notifications to Owner and Contractor(s) of observed deficiencies in the work.

4.7.2.4 Field Supervision

Visits to the site at intervals appropriate to the stage of construction or otherwise agreed in writing to become generally familiar with the progress and quality of work and to determine in general if the work is proceeding in accordance with the Contract Documents, and preparing related reports and communications.

4.7.2.5 Supplemental Documents

Preparation, reproduction and distribution of supplemental Drawings, Specifications and interpretations in response to requests for clarification by Contractor(s) or the Owner and as required by construction exigencies

4.7.2.6 Quotation Requests/Variation Orders

- Preparation, reproduction and distribution of Drawings and Specifications to describe Work to be added, deleted or modified.
- Review of proposals from Contractor(s) for reasonableness of quantities and costs of labour and materials.
- Review and recommendations relative to changes in time for Substantial Completion.
- Recommend to costs of work proposed to be added, deleted or modified.
- Assisting in the preparation of appropriate Modifications of the Contract(s) for Construction.
- Coordination of communications, approvals, notifications and record keeping relative to charges in the work.

4.7.2.7 Project Schedule Monitoring

The Developer shall monitor the progress of the Contractor(s) relative to establish schedules and making status reports of work.

4.7.2.8 Construction Cost Recording

- Maintenance of records of payments on account of the Contract Sum and all changes thereto.
- Evaluation of Applications for Payment and certification thereof.
- Review and evaluation of expense data submitted by the Contractor(s) for Work performance under cost-plus-fee arrangements.
- Maintenance of records of payments on account of the Contract Sum and all changes thereto.
- Evaluation of Applications for Payment and certification thereof.
- Review and evaluation of expense data submitted by the Contractor(s) for Work performance under cost-plus-fee arrangements.

4.7.2.9 Project Close Up

- A detailed inspection with client for conformity of the Work to the Contract
- Documents to verify the list submitted by the Contractor(s) of items to be completed or corrected.
- Determination of the amounts to be withheld until final completion.
- Securing and receipt of consent of surety or sureties, if any, to reduction in or partial release of retention(s) or the making of final payment(s).
- Issuance of Certificate(s) of Substantial Completion.
- Inspection with the client to verify final completion of the Work.
- Securing and receipt of consent of surety or sureties, if any, to the making of final payment(s)
- Issuance of final Certificate(s) for Payment.

4.8 PROJECT IMPLEMENTATION MILESTONE

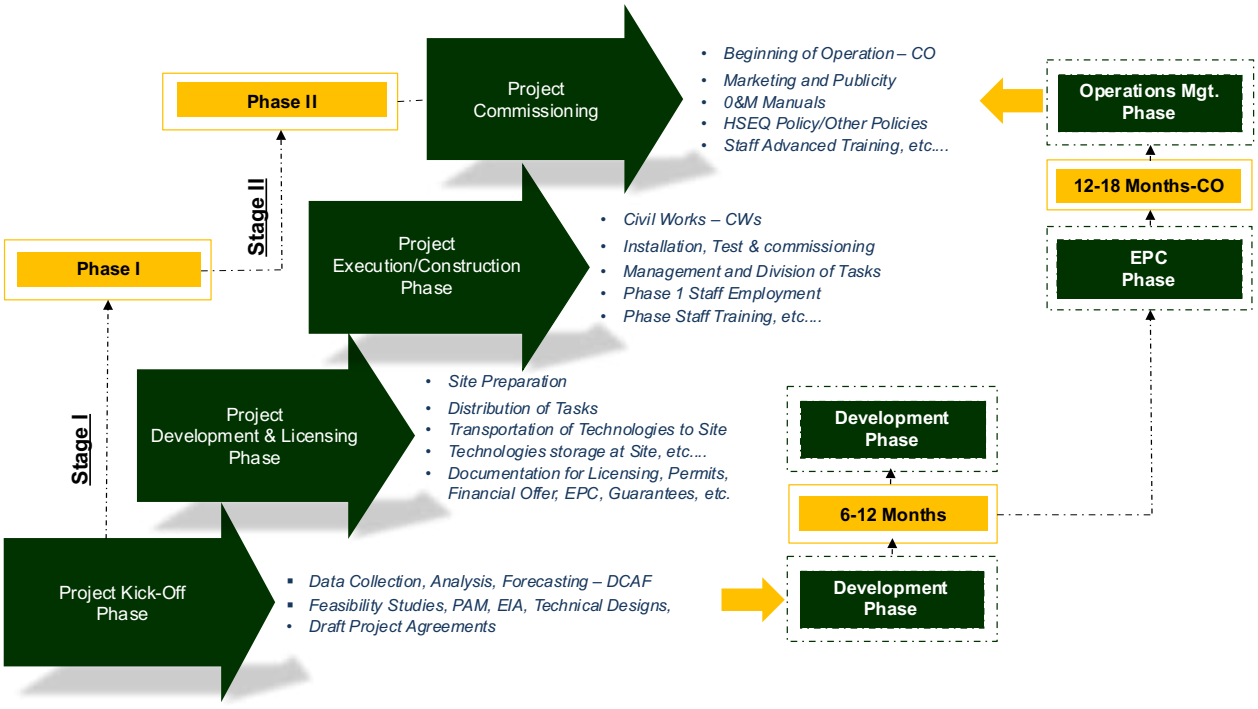

Fig. 4.1 – Project Implementation Milestone – Bankable Development, EPC and Operations Management

CHAPTER V: GENERAL CONCLUSION – DEVELOPMENT AND CONSTRUCTION POLICY AND STANDARDS

5.1 INTRODUCTION

For the purpose of a better understanding of the objectives of the Coal to IGCC Project development, the Project shall be provided with international standards.

5.1.1 POLICY

Power plants shall be provided when a crucial need exists, which cannot be satisfied economically or reliably with purchased power. When a power plant is required, it shall be designed and constructed with the lowest overall cost to own and operate; that is, the lowest overall life cycle costs for ownership, operation, maintenance, and fuel consumption during its life span.

5.2 BASIC DATA

5.2.1 PRESENT VALUE ANALYSIS (PVA)

All cost analyses for power plant investments shall be computed by using the present value (discounting) technique. In this method all benefits and costs accruing throughout the life of the facility are compared on a present value basis. The investments cost for each year of the project economic life are converted to present values by applying a discount factor.

5.2.2 COST ELEMENTS

The cost elements of an economic analysis will include non-recurring (capital cost of construction) and recurring operational and maintenance costs. The recurring costs, which are tabulated for each year of the facility useful life will include the sum of the following items:

a) Fuel Costs, considering the most environmental friendly green fuel (clean syngas);

b) Electrical Costs;

c) Water Costs;

d) Chemical Costs;

e) Operating and maintenance material costs (other than fuel);

f) Operating and maintenance labour; and

g) Any other costs related to the facility.

5.2.3 ANALYSIS FORMAT

The cost elements described above shall be summarized and tabulated for each year of the economic life of the facility and should be prepared for each alternative proposal under consideration. The annual costs shall then be summarized to determine the total project cost for each alternative proposal.

5.2.4 DISCOUNT FACTOR

In determining the present value of future expenditures the appropriate discount factor (interest rate) is applied to each annual tabulated expenditure. Discount factors are based on a 10% interest rate.

5.2.5 ECONOMIC LIFE

A maximum economic life of 25 years shall be used in cost analyses of utility investments.

5.2.6 UNIFORM ANNUAL COST

The method of project accomplishment shall be the alternative, which has the lowest uniform annual cost. The uniform cost is determined by dividing the total project cost by the factor for the end year of the project.

5.3 TECHNOECONOMIC STUDIES

5.3.1 FACTORS TO BE ANALYZED

a) Actual loads (electric and heat) and duration of loads;

b) Mobilization requirements;

c) Future expansion;

d) Sensitivity of the establishment to hazards;

e) Permanence of the power plant;

f) Standby requirements;

g) Emergency requirements; and

h) Fuel selection.

5.3.2 METHOD OF SATISFYING LOAD DEMAND

Provide the necessary utilities such as electricity and compressed air, at lowest overall owning and operating cost, with sufficient standby to preclude irreparable loss to personnel or national security, or large financial loss.

5.3.2.1 Guidelines

Consider the following:

a) Interservice possibilities; for example, one power plant to service more than one installation;

b) Only new or future costs of a project; "A sunk cost is a past expenditure or an obligation already incurred, which must be ignored as having nothing to do with a choice between two alternatives for the future." Grant. E.L, Principles of Engineering Economy, Wiley & Sons, New York, NY;

c) Continuous integrity of utility service; and

d) Past experiences with other power plants.

5.3.2.2 Plausible Methods

Consider all plausible, alternate methods of satisfying the load demands, including rehabilitation, replacement, new installation, consolidation, modernization, production of a specific fuel type (clean syngas) from available coal / combined coal and biomass.

5.3.3 COMPARATIVE COST OF ALTERNATE METHOD

5.3.3.1 Comparative Owning and Operating Costs

Estimate and tabulate the owning and operating costs for the alternate methods. Tabulate total annual costs for each project year in Format A or Format A-1 of SECNAVINST 7000.14, and apply discount factor for discounted annual cost.

5.3.3.2 Choice of Individual Components

The same economic analysis can be applied to individual components within a utility system. Since the only variables will be initial cost and energy, only these factors need be considered in the analysis.

5.4 SOURCE OF POWER

It is always a condition sine-qua-non to define the purpose for which the power generated by the plant will be used for to maximize its operational efficiency. Generally, activities shall normally be provided with three sources of electric power: primary, standby, and emergency. For further information on power sources, see MIL-HDBK-1004/1, Electrical Engineering Preliminary Design Considerations.

5.5 FUEL SELECTION AND CHARACTERRISTICS

The capability of burning another fuel shall be provided to be used when the primary fuel is not available and where it is critical to keep the power plant in operation on an emergency basis. Interruptible coal service will require a secondary fuel backup:

Palletised wood or grass or appropriate biomass fuel, which is generally required to increase the fuel efficiency

Handling equipment, firing equipment, and controls specifications and design will depend on the characteristics or thermophysical properties of the coal.

5.6 CODES AND REGULATIONS

5.6.1 CONFORMANCE

It is mandatory for the Federal Government to conform to Federal, state, and local air and water pollution abatement codes.

5.6.2 INTERNATIONAL INDUSTRIAL CODES

Where applicable, design shall conform to the industry codes including the following:

a) American Society of Mechanical Engineers (ASME);

b) American National Standards Institute (ANSI) Standards;

c) American Petroleum Institute (API);

d) National Board of Boiler and Pressure Vessels (NBBPV), Inspection Code;

e) American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE);

f) American Society for Testing and Materials (ASTM);

g) American Welding Society (AWS);

h) American Institute of Plant Engineers (AIPE);

i) National Association of Power Engineers (NAPE);

j) National Association of Corrosion Engineers (NACE);

k) National Fire Protection Association (NFPA);

l) Air and Waste Management Association (AWMA);

m) American Institute of Chemical Engineers (AICHE);

n) Institute of Electrical and Electronics Engineers (IEEE); and

o) American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME).

5.6.3 SAFETY AND HEALTH REGULATIONS AND REQUIREMENTS

5.7 PLANT LOCATION

Power plant location should be determined after evaluating the factors listed in Table 5-1 below.

Table 5-1: Plant location factors

Item	Sub-item	Comment
Climate		Will determine type of architecture of building, wall and roof U factors, heating and ventilating
	heating and cooling degree days Max. and min. wind speeds	Affects heating load and structural loading
Topography	Grades	Affects architecture and floor levels, fuel handling, fuel storage, and drainage.
	Soil - Bearing value Water table	Determines structural foundations, drainage, and underground pipe distribution
	Max. high water level	Affects floor levels, pumps, suction lifts, and foundations
	Frost line	Determines depth of water and sewer lines
	Cathodic analysis	Determines cathodic protection
	Seismic zone	Determines structural reinforcement
	Future Expansion	Affects allocation of space in plant for expansion
Altitude	Height above sea level	Affects air density and stack height
Orientation	Load Centre	---
	Air Field	Determines maximum stack heights and hazards
	Docks, railroads, and roads	Affects transportation of fuel and materials
Water supply	Condenser cooling, jacket cooling, makeup water, domestic water	Affects plant location, water treatment, filtering
Local material	**----------**	May determine materials of construction
Local rules and regulations	Air pollution, Water, Sewers Landfill. Fuel storage	Obtain permits Allot space, note fire protection requirements
Skills and availability of local labour	**---------**	Determine construction and operating manpower
Master plan	---	Make sure plant is consistent with Master Plan for activity development
Architectural requirements	---	Must be compatible with surrounding buildings

5.7.1 POWER PLANT CAPACITY DESIGN REQUIREMENTS

Power plant design varies to suit the various combination of electrical power generation and export heat requirements.

The power plant shall be designed as a primary power plant without export of heat or steam. Primary power plants must have adequate capacity to meet all peacetime requirements. Types of plants for installations not requiring export steam or heat:

a) Purchased electric power;

b) Primary Fuel Coal and Secondary Fuel Syngas for continuous duty;

5.8 ADMINISTRATIVE PROCEDURE FOR THE POWER PLANT LOADS

5.8.1 ELECTRIC POWER PLANT LOADS

To determine plant capacity, the data shown in Table 5-2 must be obtained using the demand coincidence and load factors discussed in *MIL-HDBK-1004/1*.

Table 5-2: Power plant loads for design

Types of Electric Load	Loads to be determined in kW (Determine winter and summer loads separately)
Export **Plant** **Switchgear** **Line losses**	See MIL-HDBK-1004/1 See MIL-HDBK-1004/1 See MIL-HDBK-1004/1 12% of subtotal (unless more accurate data is available) Total of above
Total present load	See MIL-HDBK-1004/1 (may be estimated by extending current load trend)
Total ultimate load	See MIL-HDBK-1004/1 (as for a summer night)
Minimum continuous	See MIL-HDBK-1004/1 (demand of services that cannot tolerate a 4-hour interruption)
Emergency load	Steam jet air ejector Feedwater heating
Plant auxiliaries	Fuel oil heating Space heating (radiation)
Export	Use diversity factor of 1.0. Space heating (ventilation) Use diversity factor of 0.8
Export (Cont.)	Use diversity factor of 0.65 For kitchen use factor of 1.0 Refrigeration (turbine drive) Refrigeration (absorption type) Process Distribution loss
Total present load	Total of above steam loads
Total ultimate load (including projected future load)	Maximum expected steam load for present and additional future electrical power generation plant steam requirements and export steam loads
Minimum continuous	Same as distribution loss
Emergency load	Demand of services that cannot tolerate a 4-hour interruption

CHAPTER VI: ENVIRONMENTAL CONSIDERATIONS

6.1 INTRODUCTION

The environmental benefits associated with the implementation of the 10 MWh IGCC power plant can easily be estimated by determining the reduction in the production of air pollutants associated with the plant.

It is our belief that this project represents an excellent solution for meeting Nigeria's looming energy challenge with sustainable environment development and protection.

To reiterate some of the points we made earlier, the facility will burn clean syngas as provided in **Figures 1.10 and 1.11** from a processed coal and cleaned from substances and contaminants, using Clean Coal Technology (CCT), which uses coal in high efficiency and clean, is a key technology to reduce the discharge of the material having high environmental load (e.g. Gasifier and Genset Combustion emission – CO_2 and SO_x) below limits. Besides, the installation of the CO_2 Capture, Storage and Utilisation Unit (CCSUU) and the Sulphur Recovery Unit (SRU) brings the IGCC to zero air emission. The traditional method for controlling SO_x emissions is dispersion via a tall stack to limit ground level emissions. The more stringent SO_x emissions requirements in force today demand the use of reduction methods as well, which include the use of low sulphur fuel, desulfurizing fuel and CO_2 Capture.

The Plant is designed to produce minimal noise; and will take up significantly less square footage. It will also be highly efficient with an efficiency rate compared to simple-cycle plants, which typically have efficiency rate. The higher efficiency means that it will have lower fuel costs and lower emissions per unit of energy produced than simple-cycle alternatives. Another important advantage is location. Medium and low voltage distribution lines and access roads for the delivery of coal run around the site; and the nearest home is about **200 m away**. The facility is also close to the major demand centres of Enugu State and Enugu Electricity Distribution Zone, which enable the export of extra generated power more efficiently and avoid the energy loss that occurs during long-distance distribution.

This IGCC Project will also be able to export steam and hot or chilled water through co-generation whenever a buyer for the heat (steam or hot water) becomes available.

A final advantage is the XENERGI's long-term flexibility to adapt to its surroundings. The facility and site will be maintained and landscaped to be consistent with the XENERGI's vision to develop Enugu State.

6.2 COMMUNITY CONSULTATION & ENVIRONMENTAL ASSESSMENT

One of the biggest things the Project Company (XENERGI) has been going for it is that all the necessary environmental approvals have been obtained for the project to move forward for the construction of the 10 MWh IGCC. Starting in May 2013, a formal consultation process was launched to inform all relevant stakeholders about the proposed facility and solicit their input.

From the very start, we made this process as open, transparent and as accessible as possible.

Before the consultation process even began, Engr. Emeka Ene and Company Top Management met with various stakeholder groups to identify and understand their perspectives on the 10 MWh IGCC project in the Free Trade Zone. This helped them significantly in developing a consultation process relevant to the communities' needs and concerns.

The open houses introduced participants to the Project, the Environmental Impact Assessment (EIA) process and the community's consultation process. They also enabled us to get feedback from the communities, at an early stage in the process, on local environmental considerations and other issues or concerns that should be addressed. Local Community's members were informed of the open houses through invitation, advertising in local newspapers, and on the MDACI's website.

In addition, we met locally with a number of community groups, including the Project Environmental Liaison Committee.

We believe that they also met many times with various government agencies in Enugu the capital of Enugu State and Federal level for instance the Federal Ministry of Power and Federal Ministry of Commerce. These included the Ministry of Environment and the Bureau of Land and Survey of Enugu State.

The Ministry of Environment of Enugu State confirmed in **March 2012** that the project could proceed. This represents a major advantage of the **10 MWh IGCC Project** over other energy options suggested for the area.

To reiterate, we've been very open and above-board about this project since day one.

We will continue to take this approach. We will meet with stakeholders on an ongoing basis to get the input and inform them of developments throughout the course of the project.

By the way, up until this year no one suggested that building the plant in the Free Trade Zone, 9th Mile Corner, Enugu, Enugu State would make opposition to the plant go away.

6.3 COMMUNITY CONSIDERATIONS

We have taken a number of steps to ensure positive outcomes for the local communities as well. These include:

- Constructing the plant to ensure that noise under normal operating conditions does not at specific locations exceed **45dBA** – which is equivalent to the sound of rustling leaves;

- Installing Continuous Emissions Monitoring systems and reporting results annually to the Ministry of Environment of Enugu State; and

- Continuing with providing information to the public and creating a volunteer Community Liaison Committee.

We will continue to be in regular discussions with the community regarding the project and have a full-time person dedicated to community liaison.

6.4 PUBLIC SUPPORT

Finally, we would like to say a few words about public support. According to a recent survey conducted in May, close to three out of every four Inhabitants of 9th Mile Corner and its neighbourhood – about **73.5%** – support the idea of a coal-to-power generation.

In addition, various business groups have told us that it's important to move quickly to resole Nigeria's energy issues. These include the Nigerian Energy Commission (NERC), the Board of PHCN, and the Enugu State government is also supportive of the Project.

6.5 EMISSION LIMITS

6.5.1 COAL POWER PLANT PROJECT EMISSION LIMITS

NO_x emissions < 25 mg/Nm^3 at 15% O_2, dry.

CO emissions < 100 mg/Nm^3 at 15% O_2, dry.

6.5.2 NATIONAL EMISSION LIMITS

There are no emission limits, especially applicable to Coal Power Plant in Nigeria. The general limits are given in some cases and the choice of applicable limits is based on socioeconomic and political conditions. (Ref: Guidelines and Standards for Environmental Pollution Control in Nigeria, Federal Environmental Protection Agency (FEPA) 1991). Those of potential interest to EUL's CPP Project are:

- Carbone dioxide (CO_2) from stationary sources 10% by volume; and

- Oxide of Nitrogen (NO_x) from stationary sources: 359 ÷ 1,000 mg/m^3.

The site CO_2 emissions are expected to be lower than 0-0.1% by volume and NO_2 emissions are expected to be lower than 50mg/Nm^3 (Nm^3 is a normal cubic meter of a dry sample of as normalized to 15% of O_2 at 279K and 1atm).

6.5.3 EMISSION LIMITS COMPARISON – EU/Nigeria/World Bank

The EUL's CPP emission is regulated by the European Union Large Combustion Plant Directive (2000/80/EC), which is based as a source for emission limits for thermal power plant with an input of energy greater than 50MWt. The Directive gives the following emission limits for steam turbine at reference conditions of 15% of O_2 at 278K and 1atm for steam turbine load above 70%.

The Coal Power Plant emission regulated by the European Union Directive 2001/80/EC emissions limits (50mg/Nm^3 of NO_2) is under the mission limits of the World Bank Group Pollution Prevention and Abatement Handbook (125mg/Nm^3 of NO_2) and the emission limits provided by the Nigeria Air Quality Standard (85mg/Nm^3 of NO_2).

The 10MWh IGCC, is designed for zero emission and wastes. All the residues from the power plant are collected, treated, packaged and sold in the international market as commodities.

6.5.4 AIR QUALITY

Our analysis shows that the proposed 10MWh IGCC emissions of air pollutants (nitrogen oxide (NO_x), sulphur dioxide (SO_2) and Carbon monoxide (CO) will not violate ambient air quality standards and the air quality impacts from these emissions of the Project are insignificant. The project's air quality impacts from directly emitted particulate matter (PM) and of the ozone precursor emissions of NO_x, volatile organic compounds (VOC), and PM precursors of NO_x and SO_2 shall be could be reduced and monitored by using Best Available Control Technology, and will provide emission offsets for their NO_x, VOC, and PM emissions. These mitigation measures reduce the potential for impacts (including cumulative impacts) from directly emitted PM10, as well as ozone and secondary PM formation to a level of insignificance.

6.5.5 MATERIAL AND ENVIRONMENTAL COMPATIBILITY

Materials issues are at the heart of any mechanical design, and in the case of IGCC, should be considered with respect to the environment, and lifetimes of the IGCC components. These issues should not be complicated because the IGCC components will be installed in the same location with similar conditions. Principal concerns are associated with corrosion, in hot, humid and salt air climates.

6.6 LEGAL AND REGULATORY FRAMEWORKS

The Federal Ministry of Environmental (FMENV) is the major Environmental Regulatory Agency for the implementation of Power and Energy Projects in Nigeria. There are also provisions for environmental issues to be regulated by Federal Acts and Decrees, States' Edicts and Governments' Edicts as well as international convention ratified by the Federal and State Governments.

This project is to be carried out in compliance with the EUL's environmental policies and the local, national and international statues applicable to the Power Generation facilities and environment in Nigeria. These are as follows:

- The defunct Federal Environmental Protection Agency (FEPA) now Federal Ministry of Environment (FMENV) regulations, guidelines and standards concerning car repairs and maintenance workshops or car manufacturing companies in Nigeria;

- The NERC regulations, guidelines and standards;

- All International Conventions on Environmental Protection that are ratified by Nigeria;

- The environmental and operational policies of the Project Company, XENERGI FZE / XENERGI LIMITED.

6.6.1 FEDERAL REGULATIONS

The FEPA, which has now transformed into the FMENV, was established in 1998 by the Federal Government of Nigeria to protect, restore and preserve the Nigerian ecosystem (Decree No. 58 of 30th December 1988). In 1992, the EIA Decree No. 86 was enacted by FEPA, which became known as the National Environmental Impact Assessment Decree No. 86 of 1992. The decree made EIA mandatory to all major public and private projects in Nigeria and is set out to achieve the following:

- Consideration of the likely impacts and the extent of these impacts on the environment before embarking upon any project or activity. Promotion and implementation of appropriate policy in all Federal lands, consistent with all laws and decision-making processes through which the objectives of the Decree may be achieved. Development of procedure for information exchange, notification and consultation between organizations and persons where the proposed activities are likely to have significant environmental impacts. This Decree gives specific powers to FMENV (FEPA) to facilitate environmental assessment of projects. The *EIA Procedural Guidelines* including car repairs and maintenance workshops or car manufacturing companies Projects and *EIA Sectorial Guidelines* published by FEPA in 1995 is intended to assist in the proper and detail execution of EIA for car repairs and maintenance workshops or car manufacturing companies projects in consonance with the EIA Decree No. 86 of 1992 Fig. 4-1 below is a flow chart which outlines the FEPA EIA management procedures.

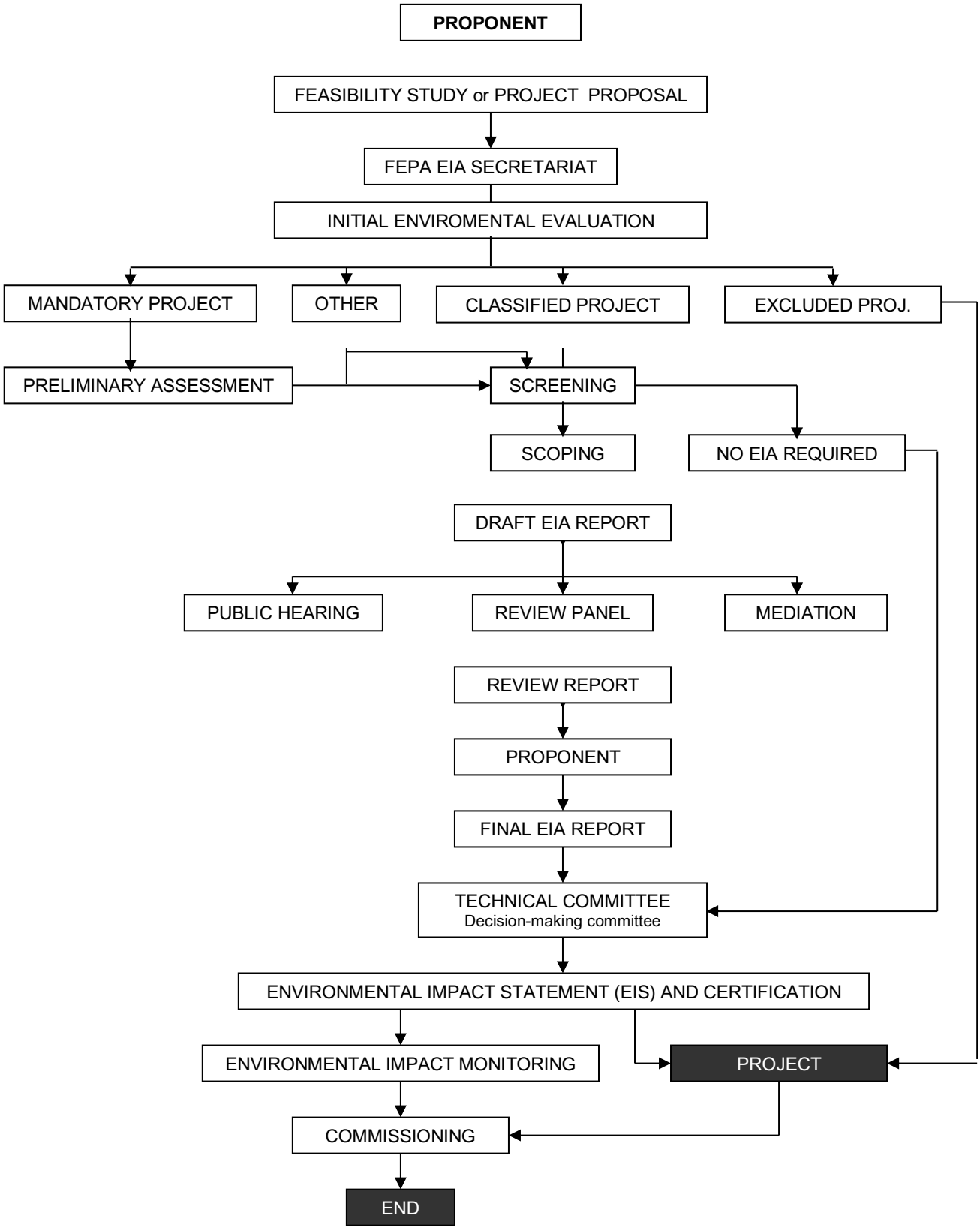

Fig. 6.1 – Flowchart of EIA Review Management Procedure (FEPA/FMENV. EIA Procedural Guidelines, 1992)

The National Guidelines for *Environmental Auditing Nigeria (1999)* makes provision for the post-commissioning monitoring of environmental performance of a projector or facility.

This is otherwise known as *Compliance Auditing* under this provision, it is mandatory for all the industries concerned to conduct Environmental Audit (EA) every three years, or whenever it is so demanded by the Executive of FEPA/FMENV.

The stage of EA is shown at the bottom of the flow chart in Fig. 4-1 above.

Other Federal legislations concerned with environmental planning and provision of environmental limitation and standards, which are relevant to proposed project include:

- National Environmental Protection (Effluent Limitations) Regulation (S. 1.8) 1991;
- National Environmental Protection (Abatement Industries and Facility Generating Waste Regulations (S. 1.9) 1991;
- National Environmental Protection (Management of Solid and Hazardous Wastes) (5.5.1) 1991;
- Guidelines and Standards of Environmental pollution control in Nigeria (1991);
- National Guidelines and Standards for Waste Management in Oil and gas Industries of 1992;
- Harmful wastes (Criminal Provisions) Decree No. 42 of 1988;
- Oil Pipeline Ordinance (Cap) 145, 1956 as amended by the Oil Pipeline Act, 1965.

  The Oil pipeline Act, 1965 does not relate directly with Environmental Protection but is relevant to this EUL's CPP because, the oil waste from Power Plant is to be piped down to the sewage facility. Oil Pipeline Ordinance (Cap) 145, 1956 as amended by Oil Pipelines Act, 1965 authorizes the Minister of Petroleum to issue Permit to Survey (PTS) the pipeline route for the purpose of transporting mineral oil, or any such products to the desired destination for the purpose connected with the company's environmental management policy. Section 15(1) of the Oil Pipeline Ordinance has provided guidelines to the management on issues related to socio-economic/cultural impacts of industrial development.

  It prohibits the entry, possession or use of any of the following land unless consent of the persons in-charge or occupiers have been obtained.

  (i) Any land used as burial ground or cemetery;

  (ii) Any land containing grave, grotto, and trees or things held to be sacred or the object of veneration;

  (iii) Any land under actual cultivation.

The National Environmental regulatory framework provides numeric limits and standards for ambient environmental quality and for emissions and effluents. The limits and standards that are relevant to this EUL's CPP activities are presented in tables 6.1 to 6.3.

Table 6.1: Noise Exposure Limits for Nigeria

Duration (hrs./day)	Permissible Exposure Limits dB(A)
9.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25 or less	115

Source: FEPA, (1991)

NOTE:
Exposure to impulsive or impact noise should not exceed 140 dB(A) peak sound pressure level.

Table 6.2: Nigerian Ambient Air Quality Standard

Pollutants	Time of Average	Limit
Particulates	Daily average of hourly values 1 hour.	250µg/m^3 *600µg/m^3
Sulphur oxides (sulphur dioxides)	Daily average of hourly values 1 hour.	0.01ppm (26µg/m^3) 0.10ppm (260µg/m^3)
Non-methane Hydrocarbon	Daily average of 3-hourly values.	160µg/m^3
Carbon monoxide	Daily average of hourly values 8-hourly average.	10ppm (11.4µg/m^3) 20ppm (22.8µg/m^3)
Nitrogen oxides (Nitrogen dioxide)	Daily average of hourly values range.	0.04ppm-0.06ppm (75.0µg/m^3,113µg/m^3)
Petrochemical Oxidant	Hourly values	0.06ppm

Source: National guidelines and standard for industrial effluent (FEPA, 1991).

NOTE
Concentration not to be exceeded for more than once a year.

Table 6.3: Effluent Limitation Guidelines in Nigeria for all categories of industries. (mg/1, unless otherwise stated)

Parameter	Limit for discharge in to surface water	Limit for land application
Colour (Lovibond Units)	7	-
pH	6-9	6-9
BODs at 20°C	50	500

6.6.1.1 National Inland Waterway Authority Decree No. 13, 1997

The Decree created the National inland waterways Authority. It is concerned with regulation of the activities in the inland waterways within the territorial boundaries of Nigeria. It undertakes capital and maintenance dredging and hydrological and hydrographic surveys. Although its spheres of operation borders on improvement and development of inland waterways to make them suitable for navigation it would appear that an ancillary duty is imposed upon it not to endanger the aquatic habitat in the course of its operations.

6.6.1.2 Environmental sanitation and protection task force

The Edict created the Environmental Sanitation and Protection Task Force – **(CRS) Edict No. 6, 1984**. Apart from ensuring the general effective cleanliness of the state, it is also empowered to lead the protection of the environment from erosion, flood, contamination and pollution.

In essence, it is clothed with the responsibility of protecting and preserving the environment. In the process nothing precludes it from enforcing the federal environmental laws already mention within the state.

6.6.1.3 Quarries Act Cap 385 Laws of the Federation of Nigeria, 1990

The act provides for and regulates quarrying activities in Nigeria. It prohibits unauthorized quarrying the activities for industrial use and diversion of watercourse or impounding of water for that purpose. The Act gives the Minister for Mines and Power the power to make regulations for prevention of pollution of natural water supply.

6.6.1.4 Criminal Code Cap 42 Laws of the Federation of Nigeria

To further complement respective environmental laws, the Criminal Code by section 247 makes it an offence to violate the atmosphere in any place so as to make it noxious to health of persons or to carry on any business in the neighbourhood or to do any act which is likely to spread the infection of a disease dangerous to human being or animals. The purport of this legislation is to secure a conductive environment suitable for human being and animals generally.

6.6.1.5 Other guidelines

- The Convention on the Prevention of Marine Pollution by Dumping of Waste, 1972;
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987; and
- The Basal Convention on the Control of Trans-boundary Movement of Hazardous Waste and New Disposal, 1989.

The Convention on Biological Diversity, 1992.

All industrial activities that will result in the biological, chemical, physical, cultural and social alteration or modification of the natural environment must be made a subject of EIA. In the process, the otherwise unforeseen and unidentified impacts of the proposed project are curtailed and made to comply with minimum standards through the legal framework.

Through follow-up program, accuracy of EIA of projects is verified and the effectiveness of measures taken to check the adverse environmental effects are ascertained.

In conclusion, for all purposes and intent, the Environmental Impact Assessment Decree No. 86, 1992 anticipated EIA of projects or activities prior to their establishments. The

case at hands does not fall squarely within the ambit of the Decree given the circumstances surrounding the CPP Project.

6.6.1.6 International Regulations

The relevant international regulatory guidelines to which Nigeria has adopted are contained in the World Bank Operational Directive 4.01 „Environmental Assessment“ 1991 in which projects are classified according to the nature and extent of their environmental impacts. It supports the use as a vital tool for achieving sustainable development.

6.7 CONCLUSION

In talking to our neighbours in Enugu State, we learned people are interested in how XENERGI FZE /XENERGI LIMITED is working to improve its environmental performance as a Company, and especially how the proposed 10MWh IGCC would work to minimize environmental impacts. MDACI/MDACI Consortium lays emphasis on the balance of energy needs and environmental interests. The selection of the most efficient EU technologies and equipment turbine will minimize air emissions and ensure the best possible air quality, well within compliance with air quality standards. Also, recent improvements in control technology allow for reduced emissions.

The proposed 10MWh IGCC will meet all health-based air emission permit requirements. In fact, it is designed to be one of the cleanest power generating units in Nigeria and in the world. Today, it is said that IGCC are the energy of the Future.

APPENDIX 1

DUTIES AND RESPONSABILITIES

The issues that will need to be addressed in the context of this assignment comprise following major parts.

1. Development Phase:

1.1 Data Gathering

- initial investigations on the availability of the primary fuel, the coal (Quantity and Quality) and secondary fuel, water (steam);
- collect historic operational performance data;
- Conduct survey of water sources (Quantity and Quality);
- Power Plant Construction Site Survey (at least Three Variants);
- Fuel Transportation to sites surveys;
- Distribution Lines, substations surveys (evacuation studies);
- Economic Data surveys.

1.2 Forecasting Process

- Divide Nigeria, make zonal projections;
- Data preparation process;
- Projected loads classified by customer etc.;
- Consider effects of improved reliability;
- Consider impact of tariffs, real time pricing etc.;
- Consider self-generation coming onto network and self-distribution;
- Models used to be installed locally with manuals;
- International and national comparisons; elasticities and cross elasticities;
- Prepare load demand data collection scheme;
- Other activities to achieve objective.

1.3 Analysis

- Sensitivity analysis;
- Load demand forecasting;
- Design Models and their applications;
- Mathematical and Thermophysical models and their application;
- Interpretation of results;
- Definition of target Goals for the Project (Implementation of the Power Plants).

1.4 Reporting

- Inception Report;
- Progress Reports (Minutes);
- Pre-feasibility Reports;

- Environmental Impact Assessment (Interim and Full) Reports:
  - Power Plants emissions, residues (Ash), etc;
  - Geotechnical Studies; and
  - Electric Energy Distribution Lines Network Area; and
- Final Full Reports:
  - Feasibility Studies; and
  - Evacuation Studies.
- Proposed Power Plants Design: Architectural, Electrical, Mechanical, and Structural Designs;
- Draft Captive Power Purchase Agreement (Between EUL and each consumer located within the Free Trade and with Residential, Commercial and industrial facilities located within a radius of 30 km from the power plant); and
- Draft Engineering, Procurement, Construction and Installation (EPCI) Agreement) between IEI and XENERGI FZE and ensuring the Project implementation and guarantees of technologies under INCOTERMS 2010 of the International Chamber of Commerce (ICC).

1.5 Expected Results

- Technoeconomic viability of the Project – (Bankable Project);
- Licenses (NERC); and
- 85% Financial Equity Shares from Developer (optional) for the EPC.

2. Project EPCI for the Implementation Phase (basic design):

2.1 Technology Design and Manufacture based on collected data

- Basic Technological Design;
- Complete Technological Design (standards, tolerances,…);
- Technology Installation settings; etc.

2.2 Construction Site Hand over to Contractor

2.3 Production, Supply and Delivery

- Steam Turbines (STs)
- Others (Piping, Pumps, etc.); and
- Energy, measuring, control system, etc.

2.4 Civil Engineering Works

- Site Preparation; and
- Civil Objects (Building, Canalization, etc.) Construction; etc.

2.5 Technology Installation

2.6 Testing and Commissioning

2.7 Project hand over to client (XENERGI LIMITED / XENERGI CONSORTIUM)

APPENDIX 2

GENERAL INSURANCE CONDITIONS
Insurance of an investment credit in foreign countries against the risk of non-repayment
(BY EGAP, a.s.)

These General Insurance Conditions are effective from 4 September 2009.

Article I.
Basic Provisions

1. These General Insurance Conditions "If" (hereinafter the "Insurance Conditions") regulate terms and conditions of insurance of a credit extended for the investment against the risk of its non-repayment resulting from prevention of transfer of returns on the investment, expropriation, politically motivated violent damage, breach of contractual obligations and commercial risks (hereinafter the "insurance"). The Insurance Conditions form an inseparable part of the Insurance Contract.

2. The Export Guarantee and Insurance Corporation provides insurance in accordance with the Act No. 58/1995 Coll., on Insuring and Financing Export with State Support and on Amendment to the Act No. 166/1993 Coll., on the Supreme Audit Office, as amended, as amended.

3. The Insurer reserves the right to request submission of an environmental impact assessment in the country of the final destination or its outright realization for projects with potential impacts on the environment. In case of a negative result of such environmental impact assessment, the Insurer has the right not to insure the credit for the investment.

4. Shall a Borrower or a person acting for the Borrower or on behalf of the Borrower violate provisions of the special law1 when negotiating the Contract on a credit for investment the Insurer is entitled to refuse insurance of the risk of the non-payment of the credit extended in accordance with these Insurance Conditions.

5. Insurance according to these Insurance Conditions is concluded as an insurance against loss and damage.

6. Provisions of the § 15 paragraphs 3 to 5, § 22 paragraphs 2 and 3, and § 24 paragraph 2 of the Act No. 37/2004 Coll., on Insurance Contract and Amendments to related Acts (the Insurance Contract Act) shall not be applicable to the insurance according to these Insurance Conditions. The § 24 paragraph 1, letter a) of the Insurance Contract Act shall only be applicable to answering of written inquiries by the Policyholder, Insured or Beneficiary.

Article II.
Definition of Terms

For the purposes of these Insurance Conditions and the Insurance Contract, it shall be understood that:

1. The Insurer is the Export Guarantee and Insurance Corporation.

2. The Insured is the financial institution, which extends a credit for the investment, which is not an Investor and is in no way economically or personally linked with the Borrower, where one person participates directly or indirectly in management, control or in the authorized capital of other person. The participation in the authorized capital shall be understood as holding of shares or of an interest of at least 10% of the authorized capital of the respective person.

3. The Policyholder is a person who has concluded an Insurance Contract with the Insurer.

4. The Beneficiary is a person for whom the right for an indemnification payment has arisen from an insurance loss.

5. A Credit Contract for Investment is a contract concluded by and between the Insured and the Borrower for purposes of providing financial means to the Borrower for the financing, particularly, of long-term financial requirements of the investment.

6. The Borrower is a Foreign Company with which the Insured concluded a credit contract for Investment or an Investor with whom the Insured concluded a Credit Contract for the Investment.

7. An Investor is a person realizing an investment who is either a legal person with the seat on the territory of the Slovak Republic who is an entrepreneur pursuant to the Commercial Code or a Foreign Company.

8. A Foreign Company is a legal person with the registered seat abroad who is controlled by a legal person having its registered seat on the territory of the Slovak Republic and who is an entrepreneur pursuant to the Commercial Code, and who participates – directly or indirectly – in the basic capital of the Company by more than 50%, or who controls the majority of voting rights related to the participation in the basic capital of the Company, or who can appoint a majority of members of the Board of Directors, Supervisory Board or other similar managing body of the Company.

9. An Investment are financial means or other pecuniary valuated assets values or property rights spent by the Investor for purposes of establishment, acquisition or increase of the participation in the Foreign Company or for purposes of expansion of entrepreneurial activities of the Foreign Company for the period of at least 3 years; the investment has to be in compliance with law of the host country and shall comprise of, particularly, following forms:

a) movable and immovable assets as well as all property rights to them like mortgages, sureties or guarantees;

b) shares, bonds, unsecured bonds of a company or any other forms of participations in companies, c) financial means, d) financial claims or claims for financial settlement arising from the investment contract;

c) the rights from the area of intellectual property including copyright law, trademark law, patents, industrial designs, technical procedures, know-how, trade secrets, business firms and goodwill connected with the investment;

d) the rights arising from an act or a contractual stipulation, from a license or a permit issued in compliance with the law, including concessions for survey, extraction, cultivation or utilization of natural resources and such.

10. A Credit for the Investment is a credit for acquisition of the investment or a credit for operation of the Foreign Company extended by the Insured.

11. Returns are amounts originating from an investment and include, particularly but not exclusively, profits, interest, loan interest, capital gains, participations, dividends, license or other fees.

12. A host country is the country on which territory the Foreign Company has a seat, inclusive of coastal waters and any sea or undersea areas over which the host country exercises its sovereign rights and has jurisdiction in compliance with international law.

13. Prevention of conversion means making impossible for an Investor to convert payments designated for the transfer from the host country as *e.g.* profits or other remittances from a local currency to any free convertible currency.

14. Impossibility of a transfer of payments means making impossible for an Investor to execute the transfer of payments in free convertible currencies to the Slovak Republic as a consequence of measures of the government or of the appropriate authorities in the host or in a third country.

15. Expropriation means a loss of ability to dispose of an investment, particularly to further own, dispose of and operate an investment or to claim returns arising from an investment as a consequence of the dispossession, nationalization or confiscation in the host country carried out without an adequate compensation to the Investor.

16. Politically motivated acts of violence mean war, hostile attacks of national or foreign armed forces, civil war, revolution, rebellion, uprising and civil unrest, politically motivated terrorist attacks and sabotages resulting in a loss of assets of the Foreign Company and of returns on the investment.

17. The Self-Retention is a portion of the Beneficiary on the loss covered by the insurance and expressed in percentage points.

Article III.
Basic Conditions for Insurance of a Credit for the Investment

1. The credit for the investment meeting the following criteria may be insured: a) the investment must represent a long-term obligation of the Investor for the period longer than 3 years; b) profits of the Investor from the investment shall depend solely on performance of the Foreign Company and on returns on the investment; c) the investment must be established in compliance with the law of the host country and the Investor and the Foreign Company have obtained necessary permits for a proper operation of entrepreneurial activities from administrative authorities of the host country; d) the Investor has concluded with the Insurer the insurance of investment in foreign countries against the risk of prevention of the transfer of returns on the investment, expropriation and politically motivated violent damage for the part of the investment which is financed from sources other than the credit for the investment.

2. Excluded from insurance are those investments into foreign companies or projects, which are related to:

   a) manufacture of arms;

   b) risky or highly speculative projects, the right to judge whether the project is risky or highly speculative lies with the Insurer,

   c) production of narcotics and psychotropic substances.

3. Such credit for the investment may be insured which:

   a) is long-term, i.e. the period from its first drawdown to its final repayment exceeds the duration of 3 years with the exception of credits with a purpose mentioned under letter;

   b) item iii., or iv. of this paragraph of the Insurance Conditions;

   c) shall be utilized particularly to long-term financial needs of the Foreign Company and/or of the Investor in connection with the investment; the purpose of the credit for the investment may be exclusively:

      i. an acquisition of an investment by the Investor;

      ii. an acquisition of long-term tangible, intangible or financial assets by the foreign company, iii. expansion of stocks of the foreign company, or iv. operational financing of the Foreign Company for purposes agreed in advance and possible to control provided return of the extended capital is ensured. The specific purpose of the credit for the investment, or a combination of above-mentioned purposes shall be stipulated in the Insurance Contract.

4. The insurance of the credit for the investment is conditioned by a partial financing of the investment from own financial resources of the Investor. Where character of activities of the Foreign Company requires also investment of the working capital, the Investor is obligated to participate with his own resources also in the financing of the working capital of the Foreign Company. The Insured shall be obligated to assess the minimum required share of the financing of the investment, and/or operation with own resources and its amount shall be determined for the respective Foreign Company by agreement of the Insured with the Insurer.

5. The Insured shall assess adequacy of control of the Foreign Company by the Investor in accordance with the Art. II, item 8 and the final decision regarding the acceptability of the respective share shall belong to the Insurer.

6. Provided the Borrower is the Foreign Company and parties in the insurance have not agreed in the Insurance Contract other way of security, the insurance of the credit for the investment is conditioned by the guarantee of the Investor to repay to the Insured the credit for the investment in case the Foreign Company should not repay the credit for reasons other than political and other non-commercial risks mentioned under Article X., par. 2 of the Insurance Conditions.

Article IV.
Environmental Impact of the Investment

1. The Insurer reserves the right to request from the Investor a presentation of an environmental impact assessment of the investment in the country of its final destination if it is a project with a potential environmental impact (hereinafter the “environmental impact assessment”). In case of a negative result of the environmental impact assessment, the Insurer has the right not to insure the credit for the investment.

2. The Investor is obligated to present the environmental impact assessment before the conclusion of the Insurance Promise Contract, or at the conclusion of the Insurance Contract at the latest.

3. An environmental impact assessment determining, among others, obligatory limits which have to be respected, is:

   a) an assessment presented in Czech and English, prepared by a person authorized according to legal regulations in the country of the final destination of the investment confirming that the environmental impact of the investment complies with international rules; the certificate of authorization of such person has to be enclosed to the assessment, or

   b) an assessment presented in English, recognized by an international financial institution in the event the investment is financed by this institution, or c) an assessment presented in English recognized by a foreign credit insurance company in the event the investment is a part of a project in insurance of which this foreign credit insurance company participates, or d) an assessment presented in Czech and English, prepared by an expert

executor contained in a list of expert executors of environmental assessments recognized by the Insurer.

4. In the event the environmental impact assessment prepared in accordance with instructions of the Insured proves the negative impact of the investment on the environment exceeding the degree mentioned in international rules and norms, the Insurer has the right to refuse conclusion of the Insurance Contract even in case the Insurance Promise Contract has already been concluded, or the Insurer has the right to request from the Investor such change in parameters of the investment project which would eliminate the identified negative impact.

5. The Insurer has the right to request from the Investor submission of monitoring reports on compliance with conclusions of the environmental impact assessment.

6. The Investor is obligated: a) to arrange for preparation of the environmental impact assessment, b) to publish results of the assessment or its summary in such way that this document is available to the public at least 30 days before commencement of the insurance, c) to observe limits specified in the environmental impact assessment during realization of the investment or to ensure observation of such limits by the investment, d) to request from the executor of the environmental impact assessment an evaluation of impact of changes on the environment in the event there have been significant changes in the investment or such changes should take place, e) to submit to the Insurer monitoring reports on compliance with the environmental impact assessment, if so requested in accordance with the par. 5.

7. The Insurer has the right of recourse against the Investor if the insurance loss has occurred for reasons of failure to comply with conditions contained in the environmental impact assessment.

Article V.
Subject of Insurance

1. The subject of insurance are receivables of the Insured from the Borrower from the extended credit for the investment, for the payment of the principal, credit interest for each interest period and fees following from the credit contract for the investment, and specified in the insurance contract (hereinafter “insured receivables”). In case the Borrower is obligated under the credit contract for the investment to repay the extended financial means in instalments, each of these instalments shall be understood as a separate insured receivable for purposes of the insurance.

2. The insurance additionally covers the exchange rate risk of movement of the exchange rate of the Czech crown against the currency in which the credit for investment has been extended in case of indemnification (see Article XI., paragraph 12).

3. Under the conditions of and in the extent stipulated in the insurance contract, the subject of insurance shall also be expenses of the Insured related to the financing of the insured receivables during the waiting period (refinancing expenses).

4. The maximum insurance value as stated in the insurance contract shall be determined in connection with the amount of the principal, interest and fees from the insured credit for the investment.

5. The maximum insurance value shall be reduced by amounts of the indemnification the Insured had received as the indemnification pursuant to these Insurance Conditions.

INSURANCE CONTRACT, INSURANCE PROMISE CONTRACT AND INSURANCE PREMIUM

Article VI.
Insurance Promise Contract

1. The Insurer undertakes in the Insurance Promise Contract to conclude an Insurance Contract upon fulfilment of agreed terms and conditions and in the time agreed, and to arrange for reservation of the necessary insurance capacity.

2. The applicant for insurance is obligated to pay a fee for the provision of the insurance promise, which is determined in the Insurance Promise Contract.

3. The Insurer is not obligated to conclude an Insurance Contract if, according to the Insurer's opinion, a substantial change has occurred in the conditions and circumstances, which have increased the level of the insurance risk against the level the Insurer had assumed when concluding the Insurance Promise Contract, especially if a substantial worsening in the risk classification of the country related to the investment had occurred.
4. During the validity period of the Insurance Promise Contract, the applicant is bound to adhere to obligations resulting from these Insurance Conditions in a similar way as the Insured.

5. Rights and obligations of contracting parties resulting from the Insurance Promise Contract are governed by provisions of the Commercial Code, especially by the provisions on an agreement on a future contract.

Article VII.
Insurance Contract

1. The Insurance Contract shall define, beside the usual essentials, primarily determination, type and volume of the credit for the investment and its time flow, the amount of the insurance premium and of the Self- Retention, the length of the insured period.

2. The Self-Retention amounts to: a) 2.5%, in case of risks under Article X., par. 2, of the Insurance Conditions (political risks), b) 5% in case of risks under Article X.,

par. 3, of the Insurance Conditions (commercial risks), unless specified otherwise in the insurance contract. Other insurance may not be arranged for the cover of the risk resulting from the specified Self-Retention.

3. Mutual financial obligations between the Insurer and the Policyholder and/or the Insured are payable in Czech Crowns unless specified otherwise in the insurance contract. For the conversion from the other currency for the purposes of determination of the amount of the insurance premium, the exchange rate specified in the Insurance Contract shall be used; otherwise, the Czech National Bank's exchange rate, which is valid on the day of signing the Insurance Contract, shall be applied.

4. The insurance premium, the fee for the provision of the Insurance Promise Contract, as well as other financial obligations towards the Insurer are to be paid on the basis of an invoice issued by the Insurer, unless specified otherwise in the Insurance Contract.

5. In case of a different modification in the Insurance Contract, the wording of the Insurance Contract shall always prevail over the wording of the Insurance Conditions.

6. The starting point of the credit for the investment shall be agreed in the Insurance Contract in a link-up with the date of its extending and the insured period in accordance with the time flow of the credit for the investment.

7. Beside the Insurer and Policyholder, the Investor shall also sign the insurance contract as a party to insurance.

Article VIII.
Insurance Premium

1. When calculating the insurance premium, the Insurer shall take into account the scope of political risks covered by insurance as they were stipulated in the Insurance Contract. The Insurer shall also take into account assessment of character and risk of the Borrower, of the investment project and evaluation of the risk level of the host country.

2. Calculation of the insurance premium shall be based on an insurance premium rate having the form of a percentage from the maximum insurance value, i.e. from the total value of the principal of the credit for the investment.

3. Unless specified otherwise in the Insurance Contract, the Policyholder is obligated to pay the agreed insurance premium in one lump sum in time determined by the Insurance Contract.

4. The agreed amount of the insurance premium contains also possible increase or decrease of the insurance premium and is unchangeable during the whole duration of insurance.

Article IX.
Duration of Insurance

1. Insurance shall commence on the day of the payment of the insurance premium unless specified otherwise in the Insurance Contract but not earlier than on the day of the conclusion of the Insurance Contract. The Insurance Contract may specify additional conditions precedent for the inception of insurance.

2. Beside cases, which are specified in the generally binding legal regulations, in the Insurance Contract or in other provisions of the Insurance Conditions, insurance also expires: a) by repayment of the credit for the investment by the Borrower or by the Guarantor, b) on the day the Insured had transferred the rights arising from the insured credit for the investment to a third person without a prior written consent of the Insurer, c) by the decision of the Insurer on the indemnification for the last insured receivable.

INSURANCE LOSS, INDEMNIFICATION

Article X.
Insurance Loss

1. An insurance loss is a full or partial non-repayment of the insured receivable by the Borrower or by the Guarantor and/or the non-repayment of the insured receivable from the security concluded in the Insurance Contract in accordance with the Article III., par. 6 of the Insurance Conditions, on its due day and not even during the waiting period, caused by the full or partial loss of value of the investment; a partial or full non-execution of a transfer of dividends, returns, profits after the payment of all taxes and fees from the investment, caused directly and exclusively by one or more circumstances representing political risks stated in the paragraph 2 of this Article (insured peril). The insurance loss is also the partial or full non-repayment of the insured receivable by the Borrower or by the Guarantor, as well as non-settlement of the insured receivable from the security concluded in the insurance contract under Article III., par. 6 of the Insurance Conditions on its due date and not even during the waiting period caused directly and exclusively by one or more circumstances representing commercial risks stated in the paragraph 3 of this Article (insured peril).

2. Causes representing political and other non-commercial risks, i.e. the risks not arising from the economic or financial situation of a foreign company but from political and economic events and measures in the host country or in a third country, which have character of force majeure in relation to the investment, are:

   a) **Impossibility of the conversion of returns –** Insurance against the risk of impossibility of the conversion of returns on the investment denominated in a currency of the host country into a free convertible currency and impossibility of the transfer of remittances to the Slovak Republic covers risks of new restrictions both of the host country and third countries, which prevent the conversion and transfer of financial means from the investment; these restriction may take form of:

i. a new stricter regulatory limitation of the exchange of the currency of the host country to foreign countries;

ii. introduction of foreign exchange regulations by the authorities of the host country;

iii. individual measures of state authorities restricting conversion and/or transfer in case of the individual payment designated for the transfer to the Slovak Republic ensuing from the existing foreign exchange regime of the host country or a third country; for the purposes of this paragraph, the transfer of the financial means is understood as the transfer of profits or capital gains, the repatriation of an original investment or proceeds from the sale of the investment, transfer of instalments of the principal and of the interest, of fees for extended technical assistance and other similar remittances related to the investment; the loss of the Investor and/or the Insured resulting from devaluation of the local currency is excluded from the insurance of the political risks,

b) **expropriation** – Insurance against the risk of expropriation covers the risk of nationalization, confiscation or dispossession of a foreign company without a proper compensation; the expropriation also covers the expropriation caused by government acts which had deprived the Investor of basic rights connected with the investment for an uninterrupted period of at least 6 months; financial impacts arising from non-discriminatory regulating and fiscal (tax) measures of the authorities of the host country and impacts of administrative measures (primarily in the fiscal area) activated by actions of the Investor or by a foreign company are excluded from the insurance;

c) **politically motivated acts of violence –** Insurance against the risk of politically motivated acts of violence covers the risk of losses of property and income from the insured investment resulting from politically motivated acts of violence; losses caused by employees of a foreign company shall be excluded from the insurance;

d) **breach of contractual obligations –** Insurance against breach of contractual obligations by the host country, its regional self-governing units or by subjects controlled or administered by them, which concern purchases of inputs of the foreign company (e.g. energy, raw materials) or sales of outputs (production of a foreign company), provided this measure has a discriminatory character towards the foreign company and the foreign company is a beneficiary from these obligations, and provided this breach has caused non-fulfilment of its obligations or prevented operation of the investment for a period of at least 6 calendar months, or it has caused a loss from its operations for a duration of at least one accounting period; the insurance also covers the risk of application of unilateral discriminatory

measures by the host country leading to losses from operations of the investment for a duration of at least one accounting period.

3. Causes representing commercial risks are:

   a) insolvency of the Borrower, especially declaration of insolvency or refusal of the petition for declaration of insolvency for the lack of assets of the Borrower, or other circumstances, which are established by the law of the host country as having the same or similar legal consequences as insolvency (financial insolvency);

   b) refusal of payment of the insured receivable by the Borrower without any legal reason (protracted default) but in those cases only when this financial insolvency or protracted default have not been caused by any reason mentioned under par. 2.

4. The Insurance Contract shall always cover risks under par. 3 letters a) and b). The Policyholder may specify in the application for the insurance which types of risks pursuant to the par. 2 or their combination he wants to conclude the insurance against.

5. The Insurer decides on insurance of the risk pursuant to the par. 2, letters a) through c) on the basis of an analysis of political risks and pursuant to the par. 2, letter d) on the basis of an analysis of the investment project or, as the case may be, on the basis of a legal opinion on a contractual security among individual subjects participating in the investment. The insurance risk according to par. 3 shall be assessed by the Insurer on the basis of an analysis of the investment project including evaluation of the return and feasibility of attaining the planned results of the investment and economic situation of the Investor. The final extent of the risk cover, determined on the basis of its acceptance by the Insurer, shall be stated in the insurance contract.

6. Risks excluded from the insurance: a) expropriation, nationalization or confiscation, provided it is an act accompanied by a full financial compensation in a free convertible currency granted by the government or by any public institution of the host country. When the Investor does not fulfil his obligation pursuant to the Article XV., par. 1, letter 1 of the Insurance Conditions, and when this had as a result the insurance loss, this circumstance shall be evaluated by the Insurer as the protracted default in accordance with the Article X., par. 3, letter b) of the Insurance Conditions, b) decisions or measures of the Slovak Republic.

7. The insurance loss occurs after expiry of the waiting period in duration of six months from the day the Insurer has received a Notification of a Threat of an Insurance Loss on a form of the Insurer, inclusive of specified annexes and documents, provided one of the circumstances according to the par. 2 or 3 has evidently occurred. During this period, the Insured is obligated to take every effective measure to avert the threat of an insurance loss.

Article XI.
Indemnification

1. The obligation of the Insurer to indemnify arises upon an occurrence of the insurance loss.

2. The Insurer shall not indemnify in case the amount of the loss does not exceed the value of three hundred thousand Czech Crowns, unless specified otherwise in the insurance contract.

3. The obligation of the Insurer to indemnify shall not arise in case the Insured delivers to the Insurer the Notification of a Threat of an Insurance Loss with a delay of more than six months after the occurrence of one of the circumstances stated in the Article X., par. 2 and 3 of these Insurance Conditions.

4. Upon obtaining the Notification of a Threat of an Insurance Loss, the Insurer is obligated to initiate, without unnecessary delay, an investigation necessary for a confirmation of the Insured's claim and for determining the extent of the Insurer's obligation to indemnify. The Insurer concludes the investigation, if possible or unless the parties do not agree otherwise, within one month from the date the insurance loss had occurred. The Insurer shall mention results of the investigation in the Decision on Indemnification.

5. For purposes of the investigation of the insurance loss and of determination of the amount of the loss, the Insured is obligated to submit to the Insurer appropriate documentation, records, and other evidence requested by the Insurer for an assessment, which are decisive for the origination and the amount of the claim for the payment of an indemnification, especially the origination of the insurance loss and reasons for it, justification of the claim, amounts of individual claims of the Insured, and documentation of the payment of the insurance premium. Furthermore, the Insured is obligated to present a valid Insurance Contract or Insurance Certificate (Insurance Policy) together with all other documents and information, which the Insurer may request.

6. The Insurer reserves the right to verify the truthfulness and accuracy of submitted documents, and of all data and information provided by the Insured, which the Insurer considers significant or necessary for the purposes of the investigation.

7. The Notification of a Threat of an Insurance Loss has to contain all necessary information. The Insured is obligated to enable the Insurer the inspection and copying of all documents necessary for the acceptation of an insurance loss and for the calculation of an amount of a loss.

8. The loss mentioned in the Notification of a Threat of an Insurance Loss shall represent:

   a) the unpaid insured receivable of the Insured from the credit for the investment up to the maximum insurance value;

b) non-refundable expenses of administrative procedures, arbitrations, consultancy services, and such, incurred with a preliminary written consent of the Insurer, or based on his instructions. The above-mentioned expenses shall be considered as a loss also in the event when steps leading to their occurrence resulted in restoration of the rights of the Insured to the investment or resulted in obtaining payments, instalments and such, provided these expenses exceed the amount of CZK 10,000.

9. For the purposes of determination of the amount of a claimed damage, the basis for the calculation of an indemnification shall be established as an outstanding amount of the insured credit for the investment as of the date of the Decision on Indemnification, increased by refinancing costs mentioned under Article V., par. 3 in the extent stipulated in the Insurance Contract and reduced by any payments received by the Insured as a settlement or as a cover of losses from the claimed damage before the day of the Decision on Indemnification.

10. The indemnification shall be determined as the amount of the effective loss determined pursuant to paragraphs 8 and 9 of this Article and reduced by the amount of the agreed Self-Retention of the Beneficiary. In case the effective loss is higher than the maximum insurance value, the indemnification shall be set at the maximum insurance value reduced by the amount of the Self-Retention.

11. Unless agreed otherwise between the Insured and the Insurer, the Insurer, when determining the amount and date of the indemnification payment, follows from the original due date of individual insured receivables. In the event, the Insured makes insured receivables payable prematurely on the basis of respective provisions of the Credit Contract as a result of default of the Borrower (acceleration of the credit), or these receivables become prematurely repayable for any other reason, these changes are not effective in relation to the Insurer and the Insurer shall not take them into account when determining the amount and date of the indemnification payment.

12. The indemnification shall be paid out in the Czech currency. Regarding Article V., par. 2, the exchange rate of the Czech National Bank valid on the day of the Decision on Indemnification shall be applied for the calculation from the foreign currency.

13. The indemnification is payable within fifteen days from the date of the issuance of the Decision on Indemnification.

Article XII.
Exclusions from Insurance, Refusal and Reduction of the Indemnification

1. The obligation of the Insurer to indemnify shall not arise (exclusions from insurance):

a) if the rights resulting from the insured credit for the investment have been transferred without a prior written consent of the Insurer;

b) in case of a dispute between the Insured and the Borrower over breach of the credit contract for the investment or over justification of the insured receivable, until an enforceable decision solving the dispute is made to the benefit of the Insured; the Insurer shall decide on the payment of an advance on the indemnification or on the payment of the indemnification within 30 days of the request of the Insured in case the dispute had been considered unjustified by the Insurer;

c) shall an Insured or a person acting for the Insured or on behalf of the Insured violate norms and rules of international law binding for the Slovak Republic.

2. The Insurer has the right to refuse the indemnification:

a) in case the Beneficiary has knowingly stated untruthful or grossly distorted data relating to the scope of the insurance loss or has withheld essential data concerning this loss when making a claim for the indemnification;

b) in all other cases specified in the Insurance Contract Act.

3. The Insurer has the right to reduce the indemnification in an appropriate extent if the non-repayment of the insured receivable has been caused, directly or indirectly:

a) by any action of the Insured or persons acting for the Insured or on behalf of the Insured, which prevents, delays or restricts the settlement of the insured receivable;

b) by application of any provision of the Credit Contract for the Investment or related documentation, which restrict the rights of the Insured or possibility of their implementation and enforcement,

c) by any following agreement between the Insured and the Borrower made after the date of the conclusion of the Credit Contract for the Investment, which prevents, delays or restricts the settlement of the insured receivable;

d) if the Insured has violated the obligations towards the Insurer as specified in the insurance contract, Insurance Conditions, and in respective provisions of the generally binding regulations related to the insurance, and this violation had a significant influence on an occurrence of an insurance loss, its course or on an increase of its consequences, or on the ascertainment or determination of an amount of the indemnification;

e) in other cases specified in the Insurance Contract Act.

Article XIII.
Cession of Rights

1. Concurrently with the partial or full payment of the indemnification, the Insurer is entitled to request the Insured to transfer, cede or otherwise surrender financial

claims related to the insurance loss for which the Insurer paid the indemnification in a way effective towards the Borrower. Upon the Insurer's request, the Insured is obligated to transfer, cede, or otherwise convey at the same time, all rights connected with these claims, especially the rights from guarantees or other forms of security.

2. Notwithstanding the cession of claims, the Insured is always obligated to enable the Insurer to recover the settlement of the insured credit for the investment. For this purpose, the Insured is obligated to submit to the Insurer all documents related to the credit for the investment, and to provide the Insurer with the necessary co-operation without unnecessary delay.

3. For reasons of expediency of the recovery of the insured receivables which have arisen from an insurance loss or for simplification of the legal procedures against the Borrower, the Insurer may authorize the Insured or a person appointed by the Insured with the recovery of the insured receivables from the Borrower or as the case may be, from persons guaranteeing the insured receivable or pertinent financial claims. The Insurer shall undertake to reimburse the Insured for purposefully spent expenses of recovery of the insured receivable on the basis of their proper accounting and evidencing on Insured's part.

4. Payments made by the Borrower or by a third person as settlements of the insured receivable from an insurance loss after the Insurer had paid out the indemnification shall belong to the Insurer and the Insured is obligated to inform the Insurer on such payments without delay and to cede these payments to the Insurer within five days upon their receipt.

5. By paying the indemnification and provided there was no preceding cession of the receivable which had arisen from an indemnification on a contractual basis, the Insurer acquires the right to yields from securities, collaterals, insurance contracts etc., or to sums paid in foreign countries and related to the investment.

6. Provided the rights of the Insured have not been transferred to the Insurer by a contract on cession of an insured receivable in accordance with the par. 1 for a reason of purposefulness of recovery of the receivable, the Insured and the Insurer shall conclude a contract on arrangement of rights and obligations regulating reciprocal rights and obligations in recovery of the insured receivable.

RIGHTS AND OBLIGATIONS OF CONTRACTING PARTIES

Article XIV.
Rights and Obligations of the Insured

1. The Insured has the right to: a) the indemnification resulting from the occurrence of an insurance loss provided the Insured is simultaneously a Beneficiary, b) request the Insurer to perform the proper investigation necessary to determine the extent of the Insurer's obligation to provide the indemnification, to state the results of investigation in the Decision on Indemnification and to inform the Insured on its

contents, c) the payment of the indemnification within the time limit of fifteen days from the date of the Decision on Indemnification.

2. The Insured is obligated to:

a) inform the Insurer without delay on an agreement on a concurrent insurance with another Insurer against the same or similar risk;

b) participate in the insured risk in the extent of the agreed Self-Retention and not to conclude another insurance for the Self-Retention, to mention in the application for the insurance all facts known to him which could have influence on assessment of the risk;

c) when applying for the insurance, to submit to the Insurer following analyses prepared by the Insured:
– an analysis of the investment project including the evaluation of the return and feasibility of attaining the planned results of the investment project; and
– evaluation of economic situation of the Investor; the Insured may perform this duty via third person, however the Insured is responsible for such analysis as if it were prepared by the Insured himself.

d) condition drawing of the credit for the investment by submission by the Borrower of purposefulness of the drawdown of the respective part of the credit, to keep documented records of the purposefulness of the drawing of the credit and to take all necessary measures for eliminating of the possibility that the Borrower would draw the credit for other purpose than was stipulated;

e) take individually, or by agreement with the Insurer, all reasonable steps aimed at preventing the occurrence of an insurance loss or the increase in its extent, especially to demand his claims properly and in time, and to enforce consistently repayment of the due insured receivable; the Insured is liable for reduced recoverability or legal enforceability of the insured receivables caused by their late presentation to court or to other relevant authority;

f) co-ordinate with the Insurer any steps taken in order to prevent a threat of an insurance loss to occur or to reduce its consequences, and to take all necessary steps against third persons with a prior consent of the Insurer; in case the Insurer does not inform the Insured on his opinion to the proposed procedure within 10 working days since receiving the request of the Insured, or if he does not agree with the Insured any other deadline for the giving his opinion, it is considered as if the Insurer gave his consent to the proposed procedure;

g) conclude, simultaneously with the indemnification payment and on suggestion of the Insurer, a contract on cession of receivables which the

Insurer has indemnified, or to conclude, in compliance with the Article XIII., a contract on arrangement of rights and obligations;

h) enable the Insurer assertion of claims, especially the claims for the compensation of damages, which belong to the Insured;

i) return to the Insurer the already paid-out indemnification if the Insured prevented the Insurer to carry out the rights ceded to him, or their cession was refused by the Insurer, or the Insured has not enabled the Insurer to carry them out properly, or if the Insured has complicated the recovery of the insured receivables for which the Insurer had paid the indemnification;

j) return to the Insurer the already paid-out indemnification if it had been provided on the basis of an incomplete or untruthful information, or without the rightful title for the payment of the indemnification, or if such claim later ceased to exist or if it had come out that facts mentioned in the Article XII. had occurred;

k) enable the Insurer a sufficient inspection of documents in order to precise and/or add to necessary data serving to needs of the Insurer;

l) inform the Insurer without delay when discovering that:
- other unusual circumstances have arisen or there is danger of an occurrence of a loss;
- he has learnt new, substantial information on the Investor or the investment;
- circumstances have occurred or measures have been taken in any country which could have a negative influence on the interests of the Insured and on the investment; and

- other circumstances have occurred which could lead to an occurrence of an insurance loss or to an increase in its extent or which may influence obligations of the Insurer arising from the insurance contract.

m) provide necessary assistance so the Insurer can obtain information also from third persons or to study their documents in compliance with above-mentioned conditions;

n) to defend own rights in an expedient way and endeavour in solving the negative situation and, if necessary, by the form of legal action at respective court or in other proceedings; the Insured is obligated to prove this fact,

o) to register duly and in a timely manner the insured receivables into insolvency proceedings in case of the insolvency proceedings (and/or similar proceedings which are established by the law of the country of the foreign company; the Insured has the right to request from the Insurer a consultation regarding steps necessary for a proper registration of the insured receivable.

3. The Insured may not cede the rights arising from the insured credit for the investment to a third person without a prior written consent of the Insurer.

4. In case of a cession of rights arising from the credit for the investment with a prior written consent of the Insurer, the Cedant becomes the Insured and the Cessionary becomes the Policyholder in the sense of the Insurance Contract Act after the execution of the cession. The insurance of the ceded insured receivables shall become void without a prior written consent of the Insurer.

Article XV.
Obligations of the Investor

1. The Investor is obligated to:

a) proceed in relation to the investment with due care and caution while taking into account international business conventions and practices, to attend to the investment and risks attached to it with a professional care, skill and foresight;

b) comply with terms and conditions of contracts related to the investment and with respective legal regulation valid in the host country or in the country through which the payment was (or should have been) executed;

c) refrain from application of any provision of the contracts related to the investment which restrict the rights of the Insured or possibility of their implementation and enforcement;

d) submit to the Insured and to the Insurer feasibility study of the investment project, liquidity plan, planned financial statements of the foreign company and of own company for the period of duration of the credit for the investment as well as other documentation requested by the Insurer for the analysis;

e) provide the Insurer with an exact and true information on own economic situation, financial and legal status;

f) in the event the Borrower is a foreign company, to give the Insurer the guarantee for the repayment of the credit for the investment to the foreign company and/or to give any suitable form of security negotiated in the Insurance Contract in accordance with the Article III., par. 6 of the Insurance Conditions ensuring the repayment of the credit;

g) inform the Insurer without delay upon any occurrence of circumstances known to the Investor which might lead to an origination of an insurance loss or to an increase in its extent, or which may affect obligations of the Insurer resulting from the insurance contract;

h) fulfill fully and on their due dates all obligations toward the foreign company;

i) acquire all necessary licences and to ascertain that the foreign company had acquired all necessary licences and permits before the start of the investment;

j) take individually and by instructions of the Insurer, all reasonable steps aimed at preventing the occurrence of an insurance loss or the increase in its extent, especially to demand his claims properly and in time, and to enforce consistently repayment of the due insured receivable; the Investor is liable for reduced recoverability or legal enforceability of the insured receivables caused by their late presentation to court or to other relevant authority;

k) fulfil fully and on their due dates all obligations from the Credit Contract for the Investment toward the Insured;

l) in case the Investor becomes a receiver of a compensation according to the Article X., par. 6, letter a), he is obligated to deposit these financial means with the account kept with the Insured and to enable the Insured their blocking minimally in the amount of the unpaid part of the credit for the investment.

2. The Investor may not change terms and conditions of the investment, may not cede the rights from the investment to a third person, establish the right of lien to the investment or to encumber the investment in any other way without a prior written consent of the Insurer.

3. The Investor may not take any steps, which may result in a loss of value of the investment, in non-performance of the transfer of dividends, returns, profits after payment of all taxes and fees from the investment and in financial insolvency of the Investor or of the foreign company.

Article XVI.
Recourse against the Investor

1. In case an insurance loss was caused by the Investor, by the Foreign Company or by persons acting for them or on their behalf, the right for the recourse against him is governed by relevant provisions of the generally binding legal regulations.

2. Upon payment of an indemnification to the Insured, the Insurer has the right to take recourse against the Investor for damages caused by the Investor or by a person to whom the Investor has ceded rights and obligations from the investment, resulting in obligation of the Insurer to indemnify the Insured and that up to the amount of the paid indemnification.

3. The recourse shall be applied, particularly in cases of:

a) financial insolvency and protracted default of the Borrower under Article X., par. 3, letters a) and b) of the Insurance Conditions;

b) exercising of the rights arising from the investment which differ substantially from international business conventions and restrict the rights of the Investor in case of an insurance loss resulting from political and other non-commercial risks;

c) violation of contractual terms and conditions related to the investment;

d) application of any provisions of contracts related to the investment which restrict rights of the Investor or possibility of their exercising and enforcement;

e) such violation of respective laws and regulations valid in the Slovak Republic, in the host country or in third countries which prevents conversion and transfer of financial means from the investment (particularly non-securing formalities and licences necessary for the transfer or conversion of payments);

f) investor's or foreign company's conduct contrary to the law of the host country, and/or acts punishable according to the law of the host country or acts contrary to the law of the host country;

g) non-compliance with terms and conditions stipulated in the environmental impact assessment of the export.

4. The right of the Insurer of the recourse against the Investor shall be governed by the recourse declaration of the Investor in the insurance contract and by respective provisions of generally binding regulations.

Article XVII.
Rights and Obligations of the Insurer

1. The Insurer is obligated to:

a) perform a proper investigation necessary to determine the extent of the Insurer's obligation to provide the indemnification;

b) state the results of the investigation in the Decision on Indemnification and to inform the Insured on its contents;

c) pay the indemnification within the time limit of fifteen days from the date of the Decision on Indemnification, d) preserve the documents entrusted and provided to the Insurer with due care.

2. The Insurer has the particular right to:

a) request payment of the insurance premium for the whole period of validity of the insurance;

b) request from the Insured and from the Investor submission of all contracts and documentation related to the investment; in doing so, the Insurer does not become responsible for the content and form of these contracts and documents;

c) increase the insurance premium rate and the Self- Retention in case that the contracts and documents given under letter b) concluded or issued by the Insured had been modified without a prior consent of the Insurer;

d) verify the truthfulness and exactness of the submitted documents and of all data and information given by the Insured, while respecting the generally binding regulations on the banking and business secrecy;

e) request from the Insured proper enforcement of the claims against third persons;

f) agree with the Insured subsequent steps in recovery and collection of the insured receivable independently from acquisition of the unpaid insured receivable and after payment of the indemnification;

g) claim from the Insured the repayment of the paid-out indemnification or compensation of damages in case that the indemnification has been provided on the basis of untruthful information, or without the rightful title for payment of the indemnification, or if such a claim later ceased to exist or if it had come out that facts mentioned in the Article XII. had occurred.

FINAL AND CLOSING PROVISIONS

Article XVIII.
Audit and Expert Examination

1. Any declaration of the Investor, together with an acceptance of obligations and duties set on the Investor by the insurance contract allow the Insurer to request an audit or an expert examination of the Investor's books and of the books of the foreign company by an authorized expert at any time.

2. This audit or expert examination, together with checks carried out in compliance with the Article XIV., shall be made by a representative of the Insurer or by an auditor or an authorized expert selected from the list of auditors and authorized experts by agreement with the Investor at Investor's costs.

Article XIX.
Final Provisions

1. Relations unregulated by the Insurance Contract or by the Insurance Conditions, are governed by the appropriate provisions of the Insurance Contract Act and of the Civil Code.

2. Wordings of the Insurance Conditions and of the Insurance Contract in the Czech language are decisive.

3. The Insurer is entitled to terminate the Insurance Contract if:

   a) the Insured has been withdrawn the authorization for entrepreneurial activities, a court has decided on insolvency of the Insured or on refusal of petition for insolvency proceedings for the lack of assets of the Insured;

   b) it is so stated in the Insurance Contract, c) it is so stated in the Insurance Contract Act, Civil Code or in other legal regulations.

4. The notice of termination must be in writing. The term of notice starts on the day of delivery of the notice of termination to other party and it lasts 6 weeks, unless stipulated otherwise by law.

5. If any provision of the Insurance Conditions or the insurance contract becomes at least partially inefficient or non-applicable as a result of a change in legal regulations, this does not make the remaining provisions invalid or void.

6. Information provided in any form by the contracting parties to each other and related to the conclusion of the insurance contract and to the fulfilment of obligations resulting from it, is confidential. The party, which has received such information may not provide it to a third person without consent of the other party, nor may use such information for a purpose different from the one for which it has been provided unless stipulated otherwise by law (e.g. the Act on Insurance, etc.). However, the Insured has the right to pass the confidential information to a person controlling the Insured.

7. Unless agreed otherwise by the contracting parties in the insurance contract, any possible disputes arising between them from legal relations established by this contract or related to it (including issues of validity or invalidity of the insurance contract), which cannot be resolved by an amicable settlement with exclusion of jurisdiction of ordinary courts in a reasonable time, shall be finally decided in arbitration proceedings at the Arbitration Court at the Economic Chamber of the Slovak Republic and the Agrarian Chamber of the Slovak Republic in accordance with its Order by 3 arbitrators appointed pursuant to this Order. Parties undertake to meet all obligations imposed on them in the arbitration decision within the time prescribed therein.

8. Insurance under these Insurance Conditions shall be governed by the rule of law of the Slovak Republic.

APPENDIX 3

QUESTIONNAIRE FOR THE ASSESSMENT OF THE ENVIRONMENTAL IMPACTS OF AN EXPORT PROJECT BY EXIMBANKA SR/EGAP, a.s.

(Appendix to the application for supported financing)

Brief description of the export, i.e., exported goods or services:

I. Basic information:

1. Name of the export project, its capacity (scope) and location.

2. Value (i.e., principal) of the export loan.

3. Possibility of cumulating with other projects.

4. Substantiated needs of the plan and its location, including overview, alternatives considered (including zero alternatives) and main reasons (from the perspective of the environment, economic viewpoints, etc.) for their selection, respectively rejection.

5. Description of the technical and technological solution of the export project.

6. Anticipated date of the beginning of the execution of the export project and its completion.

7. Is the export contract for which you are requesting an export loan a part of a project that is secured by another entity?

8. Was the assessment of the export or project, of which export is a part, performed from the perspective of the impact on the environment (EIA)?

9. From the perspective of the project, are there significant non-governmental organizations, civic associations, etc., in the target country, for which one can assume interest in dialogue regarding the project's impact on the environment?

10. In the final destination country, is there, or will there be, any releasing of information about the project (newspapers, radio, television, posters, internet…)?

II. Information about inputs

1. Land (for example category, type, class of protection, size of land required).

2. Water (for example water source, consumption).

3. Other raw materials and energy sources (for example type, source, consumption).

4. Demands on transportation and other infrastructure (for example need for related construction work)

III. Information about outputs

1. Air (for example overview of contamination sources, type and amount of emitted polluting substances, methods and effectiveness of the collecting of polluting substances).

2. Waste water (for example overview of the sources of waste water, amount of waste and place of discharging, discharges pollution, cleaning equipment and its effectiveness).

3. Waste (for example overview of the sources of waste, categorization and amount of waste, manner of handling of waste).

4. Other (for example noise and vibrations, radiation, odour, other outputs -- overview of sources, amount of emissions, methods for their containment).

5. Supplementary information (for example significant terrain modifications and alterations of the landscape)

IV. Information about the current state of the environment on the territory where the export project will be executed

1. A breakdown of the most substantial environmental characteristics of the affected area (for example current manner of use of the location and its nearest surroundings, type of vegetation cover, especially protected areas, areas of a historical, cultural or archaeological importance, densely populated areas, areas burdened beyond the level of bearable burdening, old ecological burdens, extreme conditions in the affected area).

2. Characteristics of the current state of the environment in the affected area (for example air and climate, water, land, mineral environment and natural resources, flora and fauna, ecosystems, landscape, inhabitants, tangible property, cultural heritage landmarks).

3. Overall assessment of the current quality of the environment in the affected area from the perspective of its bearable load.

Declaration of the exporter

I hereby declare that:

- the facts stated in the questionnaire, during meetings and in written correspondence related to the questionnaire are stated based on my best knowledge and are true; I did not distort or conceal anything that could have any impact on the assessment of the impacts of the export on the environment;

- I acknowledge and agree with the possibility of the stopping, up to the termination, of the contract by EXIMBANKA SR in the event of the non-compliance with the conditions arising from the assessment of the impact of the investment on the environment;

- when submitting information for the assessment of the impact of the export on the environment, I will provide the bank with the necessary cooperation

Place and date:	
Business company and registered office of the exporter:	
Signature of the person authorized to act on behalf of the exporter:	
Name and position:	

APPENDIX 4

BASIC NFORMATION REPORT (BIR) CHECKLIST FOR CREDIT/LOAN ACQUISITION FROM FINANCIAL INSTITUTIONS (EXPORT/COMMERCIAL BANKS)

I. Project Highlights

a) Project Location: _____

b) Proposed Capacity to be generated (as applicable): _____

c) Projected time to production/completion: _____

II. Key terms and conditions

Obligor: Role in Power Value Chain: (Please tick)

Fuel Supply (Not Trading)	Electricity Generation	Electricity Transmission	Electricity Distribution	Associate Services (Please Specify)

Facility Type: Term Loan
Short/Medium Term Loan
Lease
Revolving Advance

Amount:
Purpose:
Tenor:
Moratorium on principal:
Repayment Source:
Repayment Terms:
Pricing / Interest Rate: 7% p.a. all-in

III. Security: e.g. but not limited to (please tick all that apply)

- Charge over Fixed Assets
- Charge over fixed and floating asset
- Mortgage debenture
- Assignment of Receivables
- Assignment of Project Contracts
- Assignment of insurance of equipment

- Assignment of warranties on equipment
- Others (Please specify)

IV. Others collateral related issues (tick all that apply)

1. Legal Framework
2. Physical Assets
3. Project Company
4. Shares Contracts and Guarantees
5. Permits and Licenses

V. Risk Assessment Criteria

Please, fill “YES” or “NO” as appropriate.

S/N	Parameters	YES	NO
1	Has applicant been in account relationship with GTB PLC for at least 6 months?		
2	Is this an SPV set up to execute or manage the project?		
3	Is this an existing company or a start up?		
4	Is there any equity contribution and % tape of the Total Cost?		
5	Percentage and amount of Equity (x %/ =N= xxxxxxx)		
6	Are we entirely relying on the project cash flow for loan repayment?		
7	Does the project have a feasibility study?		
8	Was the feasibility study prepared by nationally or internationally reputed consultant?		
9	In your view, is the project capable of timely principal and interest payments in line with proposed financing terms?		
10	In your view, is the project able to deliver the product or service the project company was formed to produce, on a long-term sustainable basis?		
11	Is the project capable of contributing significantly to the provision of electricity to its target end-users		

VI. Assignment of Project Eligibility

Does the Project proposal have the followings?

a) Technical Issues

S/N	Parameters	YES	NO
1	Assessment of quality and track record of selected technology		
2	Age and Condition of Assets {as applicable}		
3	Independent Engineer's (IE) project evaluation		
4	Engineering and Design Status		
5	Engineering, Procurement and Construction {EPC} contract		
6	Operations and Maintenance Agreement		
7	Project Management Plan		
8	Historical operating record		
9	Evaluation of evacuation/interconnection availability		

b) Commercial Issues

S/N	Parameters	YES	NO
1	Assessment of Off-taker Credit Worthiness		
2	Power Purchase Agreement		
3	Fuel Supply Agreement		
4	Demand Studies/Outlook		
5	Tariff Structure and Levels/Outlook		
6	Foreign Exchange Exposure Levels		

c) Legal Issues

S/N	Parameters	YES	NO
1	Concession Agreements {where applicable}?		
2	Collateral Agreements, including Project completion guarantees?		
3	Lending Agreements?		
4	Equity Contribution Agreements?		
5	Land (sub-) Lease Agreements/Indenture?		
6	Mortgage, deed of trust, or similar instrument?		

d) Financial

S/N	Parameters	YES	NO
1	Does the project documentation assess		
2	Financial capacity and track record of project sponsors?		
3	Project cost structure versus regional/international benchmarks?		
4	Project debt-to-equity ratio?		
5	Debt Structure: Amortizing versus Refinancing?		
6	Debt Service Coverage Ratios (DSCR)?		
7	Project Financial Model Status?		
8	Additional Credit Enhancement?		

e) Regulatory

Are the following issues addressed?

S/N	Parameters	YES	NO
1	Licensing Status, Future Requirements and Gaps?		
2	Environmental and Social Impact Assessment?		
3	Health, Safety, and Environment Requirements/Practices?		
4	Site plan approvals, permits and leases?		
5	Decree of government support/public support?		
6	Required Tariff Levels, oops and subsidy plans?		
7	Interconnection and Use of network agreements?		

f) Project Impact Criteria

Are the following issues addressed?

S/N	Parameters	YES	NO
1	Time to impact: Will the project deliver in less than 12 months		
2	Is this a small scale project, with simple financing and regulatory Dimensions		
3	Is the project targeted at (a) specific industrial off-taker(s)		
4	Is the project private sector led?		
5	Is the main input raw material coal?		

6	Is the main input raw material diesel?		
7	Are there existing supply agreements?		
8	Is off-take or Power Purchase Agreement in place?		
9	Are there operation and maintenance contract /contractor agreement in place?		
10	Is this Captive Power Project for an Independent Power Project (IPP)?		
11	Or Grid Power Project {exclusively set up to supply power to national grid?		
12	Are the following consulates typically in project finance transaction in place i.e. financial adviser, legal adviser, technical consultant, revenue/market consultant and insurance adviser?		
13	Is design and construction contract in place?		
14	Is there a Financial model in place {including financial projection with underlining assumptions plus Debt Service Coverage Ratio, Internal Rare of Return}?		

VII. Risk Analysis

Major risks that are usually assessed in project finance transactions and how each of these risks are usually managed.

S/N	Risk	Risk Area	Mitigant
1	Development	Project Completion	Fixed price, time certain contract with liquidated damages for delays, Performance guarantees.
2	Design and construction	Cost and Time Overrun	
3	Operation and Maintenance	Useful life of Power Plant	Execution of O&M Contract with Experienced Third Party.
4	Market	Demand	Feasibility Study by credible third Party estimating likely demand for power.
5	Feed Stock Supply	Regular Supply	Proven reserve/availability and Firm supply agreement
6	Credit	Debt Services	Execution of Firm Off-take Agreement and analysis of credit-worthiness of the contract counter-parties
7	Interest Rate	Income	Typically long dated swaps are put in place for bank deals
8	Political	Regulatory- tariffs, Concessions, Willful breach of Agreement, Tax risks, etc.	Government credibility, Firm agreements, Clear & Strong regulatory framework, External arbitration provisions, etc.
9	Financial Leverage	Debt Service	
10	Exposure to Other Banks		

APPENDIX 5

PRESCORING
DOCUMENTATION FOR THE ASSESSMENT OF THE PROJECT BANKABILITY
BY MDACI, a.s./MDACI CONSORTIUM

				Pre-export Loan (Existing Importer)		Buyer Credit for an existing Company		Buyer Credit for a newly established Project Company		
			DOCUMENTATION AND BASIC INFORMATION REQUIREMENTS	Exporter	Importer	Exporter	Importer	Exporter	Importer (SPV)	Sponsor
PRESCORING	Analysis of the Subjects	1	Certificate of Incorporation from the Corporate Affairs, including CAC2, and CAC7.							
		2	Financial statements for the last completed quarter of the current accounting period.							
		3	Accounts for the last three completed financial years including the notes.							
		4	Auditor's report and the audited account for the last three (3) completed financial year.							
		5	Annual Reports for the last three (3) years							
		6	Ownership structure, including shares of the respective shareholders							
		7	Acknowledgments of indebtedness to the Tax Office, Social Security and Health Insurance							
		8	References (list of reference contracts / investments implemented)							
	Import Agreement	1	Subject of the Export							
		2	Basic parameters of the Export Agreement							
		3	Subcontractors of the Export Agreement							
	Investment	1	Description of investment, evaluation of the investment benefits for the investor							
		2	Information Memorandum							
		3	Conditions for obtaining investment (tender conditions, draft PPA, investment plan, etc.							
	Project	1	The Investment Plan – Project basic Information Report – BIR							
		2	Financial prediction of the Project for the next 12-20 years of operations.							
		3	The structure of project financing, their own financial equity resources and their security							
		4	Concluded preliminary Agreements for purchase of production (off-take Agreements)							
		5	Concluded preliminary Agreement for the supply of inputs.							
		6	Current status of the Project (construction site, permits and licenses)							
		7	Project risks and their due process from the investor's perspective							
		8	Proposed organization of the Project (liens, guarantees, etc.)							

APPENDIX 6

REGULATIONS ON APPLICATION FOR POWER GENERATION LICENSE

REGULATION NO: NERC-R-0110A
NIGERIAN ELECTRICITY REGULATORY COMMISSION

In exercise of the Powers to make Regulations conferred by Section 96 (1) & (2) (c) & (d) of the Electric Power Sector Reform Act 2005 (Act No. 6 of 2005), and Clause 20 of these Regulations, the Nigerian Electricity Regulatory Commission makes the following Regulations for the Application for Licence (Generation, Transmission, System Operations, Distribution & Trading) 2010, to repeal the Regulations for the Application for Licence (Generation, Transmission, System Operations, Distribution & Trading) 2006.

Arrangement of Clauses

CHAPTER V
SUSPENSION AND CANCELLATION OF LICENCE

16. Suspension of Licence.
17. Cancellation of Licence.
18. Withdrawal of Licence

CHAPTER VI
MISCELLANEOUS

19. Rehearing and Appeals.
20. Withdrawal of Application.
21. Amendment or Repeal of Regulations.

SCHEDULES

I. Mandatory Submissions for Applications for Generation Licences (Schedule 1A)
II. Requirements for Applications for Generation Licence (Schedule 1B)
III. Mandatory Contents of A Business Plan (Schedule 1F)
IV. Application for Licence Form (Schedule 2)
V. Application for Amendment of Licence (Schedule 3)

NIGERIAN ELECTRICITY REGULATORY COMMISSION
Application for Licences (Generation, Transmission, System Operations, Distribution & Trading) Regulations, 2010

CHAPTER I
GENERAL

1. Short title and commencement

(1) These Regulations may be cited as the **Nigerian Electricity Regulatory Commission Application for Licences (Generation, Transmission, System Operations, Distribution & Trading) Regulations, 2010.**

(2) These Regulations shall come into force on the date on which it is approved by a resolution of the Commission.

(3) These Regulations shall be signed by the Chairman who shall also cause the seal of the Commission to be affixed thereon.

(4) The Regulation, Nigerian Electricity Regulatory Commission Application for Licences (Generation, Transmission, System Operations, Distribution & Trading) Regulations, 2006 is hereby repealed.

(5) The Electricity (Private Licences) Regulations of 1965 is hereby repealed.

2. Interpretation

(1) In these Regulations, unless the context otherwise requires: “Act” means the Electric Power Sector Reform Act, 2005.

“Application” means an Application for a licence, or for an amendment, renewal, or extension of the tenure of a licence under the Act.

“Business Rules” means the Nigerian Electricity Regulatory Commission (Business Rules of the Commission) Regulations, 2006 and as amended.

“Chairman” means the Chairman of the Nigerian Electricity Regulatory Commission.

“Commission” means the Nigerian Electricity Regulatory Commission.

“Commissioner” means a Commissioner appointed in accordance with the Act.

“Competent Authority” means Chairman, Commissioner or such other Officer of the Commission designated from time to time for the purpose by the Commission in accordance with these Regulations.

“Days” means working days, excluding Saturdays, Sundays, and public holidays declared by the Federal Government of Nigeria

“Defence Purposes” includes properties used as military installations, military divisions, military brigades, military barracks, army depots, military bases, naval shipyards, naval dockyards, Nigerian Defence Academy (NDA), Defence Industries Corporation of Nigeria (DICON), Command and Staff Colleges, War Colleges, etc.,

“Generation Licence” means a licence granted under Section 64 (1) of the Act.

“Licence” shall include all licences, which the Commission is empowered to issue under the Act.

“Licensee” means any person who holds a licence issued by the Commission.

“Month” means a calendar month.

“Officer” means a staff or authorized representative of the Commission.

“Person” includes an individual, a company, partnership or any association of individuals, whether incorporated or not.

“Regulations” mean the Nigerian Electricity Regulatory Commission Application for Licences (Generation, Transmission, System Operations, Distribution & Trading) Regulations, 2010.

"Schedule" means the Schedule appended to this Regulation.

"System Operation Licence" means a licence granted under Section 66 (1) of the Act.

"Trading Licence" means a licence granted under Section 68 (1) of the Act.

"Transmission Licence" means a licence granted under Section 65 (1) of the Act.

(2) Words importing any one gender includes the other gender and the singular includes the plural and vice versa.

(3) Words or expressions used in these Regulations but not defined, unless the context otherwise requires, shall have the same meanings respectively assigned to them in the Act.

CHAPTER II
APPLICATION FOR LICENCE

3. Manner of Application

(1) An Application for a licence shall be made in writing addressed to the Chairman of the Commission and delivered by hand or sent by regular mail or courier to the Commission at its headquarters.

(2) An Application shall be signed and dated by the authorized representative of the Applicant.

(3) An Application shall be submitted in three (3) paper copies along with an electronic version in Microsoft Office software format contained in a CD-ROM.

4. Form of Application

An Application shall be in the form specified in Schedule 2 of this Regulation and shall contain the information therein specified. The Application Form may be obtained from the office of the Commission or downloaded from the Commission's website.

5. Information and Documents to Accompany Application

All Applications for licences shall be accompanied with all the information specified in the Application form relating to the specific licence being applied for.

6. Processing Fee for Application

The Applicant shall upon submission of the Application Form, pay a non-refundable fee as may be fixed by the Commission for the processing of the Application as provided in the Regulations for Licence and Operating Fees 2010 and as amended.

7. Acknowledgement of Application

On receipt of the Application, the Commission shall note thereon the date of its receipt and shall send to the Applicant an acknowledgement stating the date of the receipt.

8. Additional Information

(1) The Commission may upon review of the Application require the Applicant to furnish, within a specified period, any additional information; provided however that the time between the receipt of the Application and the accompanying documents and date on which the Commission notifies the Applicant of the inadequacy of the documents and information shall not exceed one month.

(2) An application shall lapse if the applicant does not submit all required documents within sixty (60) days from the date, which the Commission requests for the additional information.

(3) An application, which has lapsed cannot be reactivated. However such an Application may be resubmitted as a new Application, upon payment of the prescribed processing fee.

9. Notification of Due Filing of the Application

If the Commission finds the Application to be complete, it shall pass a Resolution that the Application has been duly made. Within 30 days of the passing of the Resolution, the Commission shall notify the Applicant in writing that the Application has been duly made, and request that the applicant publish the Statutory Public Notice

10. Publication of Notice of Application

(1) Within thirty (30) days after receiving the Commission's acknowledgement that an Application has been duly made, the Applicant shall at his own expense, cause a notice of the Application, in the form and manner prescribed by the Commission, to be published.

(2) The notice shall be published in at least two daily newspapers, one of which must be a local newspaper with wide circulation in the area where the Applicant intends to operate as a licensee, and the other a national newspaper, and shall state the period within which any objection or representation in connection with the Application may be made to the Commission. The Applicant shall forthwith send a copy of each of the newspaper publications to the Commission.

(3) The Commission shall not issue any licence until all objections or representations regarding the Application received by the Commission, have been considered.

11. Objection and Hearing

(1) Any person wishing to object to the grant of a licence shall file a written objection within twenty-one (21) days from the date of the Public Notice. The objection shall

be filed in the form of a petition to the Commission in two (2) paper copies and an electronic copy in Microsoft Office software format contained in a CD-Rom.

(2) The petition shall be made available to the Applicant by the Commission for a reply.

(3) Following the publication of the Public Notice and lapse of the time specified for filing objections, the Commission may proceed to place the Application for hearing upon its evaluation and consideration of any objection filed.

(4) The Commission shall give the notice of inquiry or hearing to the Applicant, the persons who had filed objections, and such other authority, person or body as the Commission considers appropriate. The conduct of the hearing shall be in the form and manner prescribed by the Commission and shall be concluded within a period of thirty (30) days.

(5) The Commission may refuse such an inquiry if in its opinion the objection is frivolous or vexatious.

(6) The findings of the Commission following the inquiry/hearing shall be recorded in writing.

12. Approval or Refusal of Licence

(1) After due consideration of the Application and inquiry if any, the Commission shall grant or refuse to grant the licence.

(2) The period between the acknowledgement of receipt of the Application as specified in Clause 9 and the date on which the Commission notifies the Applicant of its decision or proposed decision to approve or refuse the licence as the case may be, shall not exceed 6 (six) months.

(3) Where the Commission has approved a licence, the Commission shall inform the Applicant in writing of such approval and the conditions to be satisfied, including the fees to be paid before the grant of the licence.

(4) If the Commission intends to refuse the grant of a licence, it shall notify the Applicant in writing of its intention stating the reasons for the decision.

(5) The Applicant shall have the opportunity to make adequate representations to the Commission within twenty-one (21) days of the Applicant's receipt of the notification from the Commission of the refusal of a licence.

(6) The Commission shall consider the representation made by the Applicant and shall, if the representation is unsuccessful, or no representation was made, duly notify the Applicant in writing that the Application for a licence has been refused.

(7) The reasons for refusing the licence shall be clearly stated in writing by the Commission to the Applicant.

CHAPTER III
AMENDMENT AND RENEWAL OF LICENCE

13. Amendment of Licence Granted

(1) The terms and conditions of a licence granted by the Commission may be amended:

(i) on Application by the licensee in the form specified in Appendix 7 of this PAM;

(ii) upon the Commission receiving a complaint from any consumer, eligible customer, consumer association, association of eligible customers or other licensee;

(iii) on the Commission's own initiative.

(2) An application for amendment may be made any time after the issuance of the licence, but at least nine months before the expiration of the licence.

(3) For all amendments not initiated by the licensee, the Commission may amend the Licence Terms and Conditions if satisfied that:
(i) any circumstance exists which renders it necessary in the public interest to amend the license,
(ii) the licensee is unable to meet certain requirements set by the Commission in the Terms and Conditions,
(iii) the licensee has defaulted in complying with certain provisions of the Act, Regulations of the Commission, Market Rules, and Network Codes, and
(iv) there is a material change in circumstance of the licenses.

(4) Unless otherwise specified in writing by the Commission, the applicant shall pay a non-refundable fee, as may from time to time be fixed by the Commission for the processing of the Application as provided in the Regulations for Licence and Operating Fees 2010 and as amended.

(5) Where a licensee makes an application for the amendment of a licence, the licensee shall publish a notice of the proposed amendments to the licence in the form and manner specified by the Commission.

(6) The procedure prescribed in Chapter II for an application for licence, in so far as it can be applied by the Commission, shall be followed while dealing with an application for amendment of a licence; provided however that where the proposed amendment is as a result of the Commission's initiative, the Commission shall be responsible for the publication of the public notice stating the proposed amendments, if required.

(7) Where the proposed amendment is in respect of a licensee providing service to an area covering a building or place occupied by the Federal Ministry of Defence

for defence purposes, the Commission shall obtain the consent of the Federal Ministry of Defence before making the amendment to the licence.

14. Renewal of Licence

(1) An Application for the renewal of a licence granted by the Commission shall be made at least nine (9) months before the expiration of the licence and shall be in the form specified in Schedule 4 of this Regulation.

(2) Unless otherwise specified in writing by the Commission, the applicant shall pay a non-refundable fee as may from time to time be fixed by the Commission for the processing of the Application as provided in the Regulations for Licence and Operating Fees 2010 and as amended.

(3) The procedure prescribed in Chapter II for grant of licence, in so far as it can be applied by the Commission, shall be followed while dealing with an Application for renewal of licence.

CHAPTER IV
EXTENSION OF TENURE OF LICENCE

15. Extension of Tenure of Licence

(1) Any Person who has been issued a licence by the Commission may apply for a Licence Tenure Extension under the provisions of this regulation.

(2) The application must be submitted within the first five (5) years of the initial term of the licence.

(3) Unless otherwise specified in writing by the Commission, the applicant shall pay a non-refundable fee as may from time to time be fixed by the Commission for the processing of the Application as provided in the Regulations for Licence and Operating Fees 2010 and as amended.

(4) An Application shall be in the form specified in Schedule 5 of this Regulation and shall contain the information therein specified, and shall be submitted with the required information specified in the Application Form relating to the specific licence tenure extension being applied for. The Application Form may be obtained from the office of the Commission or downloaded from the Commission's website.

(5) The procedure prescribed in Chapter II for grant of licence, in so far as it can be applied, shall be followed while dealing with an Application for extension of tenure of licence, except Clause 12(b).

(6) The Commission shall consider the application and reach a decision to grant or refuse to grant a tenure extension within three (3) months of the submission of a complete application to the Commission.

(7) An application for extension of tenure of a license can only be granted once during the initial tenure of the licence being extended.

(8) Where the application is in respect of a licensee providing service to an area covering a building or place occupied by the Federal Ministry of Defence for defence purposes, the Commission shall obtain the consent of the Federal Ministry of Defence before granting the extension of tenure of the licence.

CHAPTER V
SUSPENSION AND CANCELLATION OF LICENCE

16. Suspension of Licence

(1) The Commission may on its own initiative or upon receiving a complaint or information from any consumer, eligible customer, consumer association, association of eligible customers or other licensees, initiate an inquiry into the conduct or activities of any licensee.

(2) The Commission, may if satisfied that one or more grounds listed hereunder exist, suspend the licence in the manner specified.

(3) The Commission may suspend a licence granted if a licensee:

(i) is unable to fully discharge the functions or perform the duties imposed on it by the Terms and Conditions of the licence, the Act, applicable Legislations, Regulations of the Commission, Market Rules, Rules and Regulations, and Network Codes; or

(ii) has defaulted in complying with the Terms and Conditions of this Licence, any Decisions or Orders of the Commission; or

(iii) is carrying out its licensed business in a form and manner which constitutes an immediate threat to public health and safety or the health or safety of any person; or

(iv) if the licensee refuses to submit itself to investigations or inquiry by the Commission or obstructs any officer assigned to do so or fails to produce documents for inspection as directed by the Commission; or

(v) any circumstance exists which renders it necessary in the public interest to suspend the license.

(4) The Commission shall inform the licensee in writing of the grounds upon which the Commission proposes to suspend the licence and give the licensee an opportunity to make representations against the proposed suspension or undertake to rectify/remedy the situation that gave rise to the proposed suspension.

(5) Where the licensee chooses to make a representation and/or rectification of the grounds that gave rise to the proposed suspension of the licence, it shall make its representation and/or rectification within thirty (30) days from the date of its receipt of the Commission's letter informing it of the grounds upon which the Commission proposes to suspend its licence.

(6) The Commission shall take into cognizance the representation made by the licensee in reaching a final decision. The decision of the Commission shall be communicated to the licensee in writing.

(7) If the Commission decides to suspend a licence, it shall notify the licensee of the date on which the suspension shall take effect, and the Commission may make orders regarding the undertaking of the licensee including an order empowering another person or licensee to take over the operations of the undertaking in order to maintain continuity in the provision of electricity services.

(8) The Commission may after the imposition of the suspension order, review the order and either cancel the licence in accordance with provisions of Clause 16 or lift the suspension of the licence and restore the undertaking to the licensee.

(9) The Commission shall not impose a suspension order in excess of six (6) months and may review the order before the expiration of the suspension term imposed.

17. Cancellation of Licence

(1) The Commission may on its own initiative or upon receiving a complaint or information from any consumer, eligible customer, consumer association, association of eligible customers or other licensees, initiate an inquiry into the conduct or functioning of any licensee.

(2) The Commission may cancel a licence if:

(i) the licence was issued through fraud or the misrepresentation or non-disclosure of a material fact; or

(ii) the licensee has willfully or unreasonably contravened any provisions of the Act, applicable Legislations, Regulations of the Commission, Market Rules, Network Codes, Rules and Regulations; or

(iii) the licensee has failed to comply with any term or condition of the licence the breach of which is expressly declared to render it liable to cancellation;

(iv) the licensee becomes insolvent or is adjudged bankrupt; or

(v) the financial position of the licensee is such that the licensee is unable to fully and efficiently discharge the duties and obligations imposed by the licence.

(3) The Commission, if satisfied that enough grounds exist for the cancellation of the licence, shall give notice of proceedings for the cancellation of the licence to the licensee and to such other persons, group of persons or body as it may consider necessary.

(4) The proceedings by the Commission on the cancellation of the licence, in so far as it is applicable, shall be in the manner prescribed by the Commission provided that:

(i) The Commission shall notify the licensee in writing of its intention to cancel the licence and the reasons for doing so and;

(ii) The licensee shall be given the opportunity to demonstrate, within sixty (60) days of the delivery of such notification, that the circumstances have changed such that the cancellation may no longer be warranted.

(5) If the Commission decides to cancel the licence after complying with the laid down procedure, the Commission shall serve notice to the licensee specifying the effective date from which such cancellation shall take effect.

(6) The Commission may instead of cancelling the licence, pass any other Order imposing further terms and conditions subject to which the licensee is permitted to operate thereafter.

(7) The Commission may upon the cancellation of a licence, make Orders in regard to the undertaking of the licensee, including an Order for the sale of the undertaking of the licensee, as are in the opinion of the Commission, necessary for maintaining continuity in the provision of electricity service, and in furtherance with its objectives in Section 32 of the Act.

18. Withdrawal of Licence

(1) The Commission may withdraw a licence for a generating station not yet operational if the licensee:

(i) obtained the licence through fraud or the misrepresentation or non-disclosure of a material fact; or

(ii) wilfully or unreasonably contravenes any provisions of the Act, applicable Legislations, Regulations of the Commission, Market Rules, Network Codes, Rules and Regulations;

(iii) fails to comply with the milestones upon which the licence was issued;

(iv) contravenes any term or condition of the licence;

(v) becomes insolvent or is adjudged bankrupt; or

(vi) fails to commission the licensed generating station listed in the Schedule within three (3) years from date of grant of licence.

(2) The Commission shall inform the licensee in writing of the grounds upon which the Commission proposes to withdraw the licence and give the licensee a reasonable opportunity to make representations against the proposed withdrawal.

(3) Where the licensee chooses to make a representation, it shall make its representation within thirty (30) days from the date of its receipt of the Commission's letter informing it of the grounds upon which the Commission proposes to withdraw its licence.

(4) The Commission shall take into cognizance the representation made by the licensee in reaching a final decision. The decision of the Commission shall be communicated to the licensee in writing.

(5) If the Commission decides to withdraw a licence, it shall notify the licensee of its decision in writing, and may make orders to that effect.

(6) A licence which has been withdrawn cannot be reactivated, amended, renewed, or have the tenure extended. However, another application may be submitted for the same generating station, upon payment of the prescribed fee.

CHAPTER V
MISCELLANEOUS

19. Rehearing and Appeals

(1) Any person who is aggrieved by a decision of the Commission pursuant to this Regulations may, within twenty-one (21) days after the decision is made, apply to the Commission for a review of the following:

(i) an Order of the Commission;

(ii) a Decision of the Commission not to grant a licence;

(iii) a Decision of the Commission to refuse to renew, amend or extend the tenure of a licence; or

(iv) a Decision of the Commission to withdraw, suspend or cancel a licence

(2) The Commission shall in accordance with its Rules of Proceedings reaffirm, reconsider, vary or rescind its decision before issuing a final Order.

(3) Such review or reconsideration shall be completed within sixty (60) days of the date it is requested.

(4) All Orders, or Decisions of the Commission are subject to judicial review by the High Court as provided in Section 49 of the Act.

20. Withdrawal of Applications

(1) An Application for a licence, an amendment, a renewal, or a licence tenure extension may be withdrawn in writing by an Applicant at any stage.

(2) An application, which has been withdrawn, cannot be reactivated. However such an Application may be resubmitted as a new Application, upon payment of the prescribed processing fee.

21. Amendment or Repeal of Regulation

The Commission may amend or repeal the provisions of these Regulations.

THE COMMON SEAL OF NIGERIAN ELECTRICITY REGULATORY COMMISSION Was affixed pursuant to the ORDER OF THE COMMISSION

SCHEDULE 1

MANDATORY SUBMISSIONS FOR APPLICATIONS FOR GENERATION LICENCES BY NERC

1. Completed Application Form.

2. Certificate of Incorporation and Memorandum and Articles of Association, **or** Deed of Partnership, **or** Deed of Trust.

3. Registered Title Deed to Site, **or** Sale Agreement, **or** Deed of Assignment/Gift, **or** evidence of submission of a title deed to a relevant land processing agency (as applicable).

4. Tax Clearance Certificate for immediate past three (3) years.

5. Ten-year Business Plan.

6. Off-take Agreement or Arrangement.

7. Environmental Impact Assessment (EIA) Approval Certificate, **or** Proof of submission and acceptance for processing of the Report on EIA to the Ministry of Environment, **or** Details on how effluents and discharges will be managed (if proposed capacity is less than 10MW).

8. Fuel Supply Agreement, or a letter from a fuel supplier and transporter indicating the inclusion of the fuel needs of the applicant in the supply plans of the fuel supplier and transporter.

9. MoU with or Letter of intent from Engineering Procurement Contract (EPC) Contractor (if applicable).

10. MoU with or Letter of Intent from the technical partner (if applicable).

11. Financing Agreements **or** Letter to fund the project from financial institution(s).

12. Timelines for commissioning of the power plant and on the date when different capacities of the plant will come into operation.

SCHEDULE 2

REQUIREMENTS FOR APPLICATIONS FOR GENERATION LICENCES
BY NERC

A. GENERAL REQUIREMENTS:

(i) Site Map: Showing fuel delivery and storage locations, transmission evacuation site, water pipelines, gaseous, liquid and solid waste disposal areas etc.

(ii) Location Map: Showing Roads, Rail Lines, Transmission Lines, Rivers, Reservoirs, etc.

(iii) A principal single-line diagram of the project site.

(iv) Fuel Sourcing, Transportation and Supply Arrangements.

(v) Water supply and availability analysis for plant and staff use.

(vi) Plant Design.

(vii) Power Station Information:

a. Total capacity (MW)

b. Number of Generating Units

c. Size of Generating Units (MW)

d. Expected Annual Generation (MWh)

e. Proposed Running Regime

f. Station Load/Load Factor

(viii) Generator Unit Information:

a. Generator Type

b. Rating (MVA, MW)

c. Terminal Voltage (KV)

d. Rated Frequency

e. Rated speed (RPM)

f. Automatic Frequency Control Facility

g. Rated Power Factor

h. Unit Efficiency

i. Short Circuit Ratio

j. Direct Axis Transient Reactance

k. Direct Axis Sub-transient Reactance

l. Quadrature Axis transient reactance

m. Generator Cooling (Air-cooled, Hydrogen etc.)

n. Auxiliary Power Requirements

o. Type of Exciter (Static or Rotating, Self or Separately Excited)

p. AVR type

q. Generator Protection (Relays)

r. Type and Characteristics of Governor Control System

s. Generator Unit Transformer Data

t. Manufacturer's name / Year of Manufacture / Warranty

(ix) Engineering, Procurement and Construction (EPC) Contract. (Please refer to the report on the Guide to the Development of Independent Power Plants)

(x) Details of Phasing of Project, if applicable.

(xi) Auxiliary Systems: Please refer to the report on the Guide to the Development of IPPs.

(xii) Ancillary Services:

a. Black Start facilities

b. Reactive Power Generation capabilities

c. Frequency Response Capability

d. Maximum Generation (MAXGEN) capability

e. Fast Start capability

(xiii) Report of evacuation studies (For Grid Connection):

a. Load Flow Studies

b. Stability Studies

c. Short Circuit Studies

(xiv) Station Safety Arrangements:

a. Emergency Response Plan

b. Fire Fighting Facilities

c. First Aid

d. Safety Awareness and Staff Training Plans

e. Personal Protective Equipment (PPE)

f. Health & Safety Policy

(xv) Environmental Impact Assessment (EIA) and Waste Management Plan

(xvi) Expected date of Commissioning

(xvii) Evidence of approval from Transmission Company of Nigeria (TCN) confirming that proposed connection point has capacity to take load which will be fed to it Connection.

B. SPECIFIC REQUIREMENTS FOR COAL POWER PLANT:

Turbine Unit Information:

(i) Steam Turbine/ Coal Steam-Turbine Type;

(ii) Minimum and Maximum Rated Capacity;

(iii) Heat Rates or Efficiency at rated capacity;

(iv) Fuel quality specifications requirements;

(v) Noise Level;

(vi) Run-up and Run-down Rates;

(vii) Minimum Synchronizing Generation; and

(viii) Manufacturer's name/Year of Manufacture/Warranty.

APPENDIX 7
NIGERIAN ELECTRICITY REGULATORY COMMISSION
Permits for Captive Power Generation Regulations

CHAPTER I
GENERAL

1. Short title and commencement

(1) These Regulations may be cited as the **Nigerian Electricity Regulatory Commission (Permits for Captive Power Generation) Regulations, 2008.**

(2) These Regulations shall come into force on the date on which it is approved by a resolution of the Commission.

(3) These Regulations shall be signed by the Chairman who shall also cause the seal of the Commission to be affixed thereon.

2. Interpretation

(1) In these Regulations, unless the context otherwise requires:

"Act" means the Electric Power Sector Reform Act, 2005, or any amendment thereof.

"Captive Power Generation" means generation of electricity exceeding 1 MW for the purpose of consumption by the generator, and which is consumed by the generator itself, and not sold to a third-party.

"Captive Power Plant" means a power plant of over 1MW in capacity set-up by the generator for own use.

"Chairman" means the Chairman of the Nigerian Electricity Regulatory Commission.

"Commission" means the Nigerian Electricity Regulatory Commission.

"Commissioner" means a Commissioner appointed in accordance with the Act.

"Competent Authority" means Chairman, Commissioner or such other Officer of the Commission designated from time to time for the purpose by the Commission in accordance with these Regulations.

"Licensee" means one who holds a license issued by the Commission.

"Month" means a calendar month.

"Officer" means a staff or authorized representative of the Commission.

"Permit" means a permit granted by the Commission under this Regulation.

"Permit holder" means any person issued a permit by the Commission pursuant to the provisions of this Regulation.

"Person" includes an individual, a company, partnership or any association of individuals, whether incorporated or not.

"Schedule" means the Schedule appended to this Regulation.

"Secretary" means the Secretary of the Commission.

Words importing any one gender includes the other gender, and the singular includes the plural and vice versa.

Words or expressions used in these Regulations but not defined unless the context otherwise requires shall have the same meanings respectively assigned to them in the Act.

CHAPTER II
APPLICATION FOR A PERMIT

3. Form of application

(a) Pursuant to Section 32(1)(a), 32(1)(e), and 32(2)(d) of the Act which empowers the Commission to preserve efficient industry and market structures, and to ensure the optimal utilization of resources for the provision of electricity services; to ensure the safety, security, reliability, and quality of service in the production and delivery of electricity to consumers; and to regulate persons engaged in the generation, transmission, system operation, distribution, and trading of electricity, any person wishing to construct, own, maintain, install, and/or operate a captive generating plant shall first apply for and obtain a permit issued by the Commission, on such terms and conditions as the Commission may fix in the permit, and in accordance with this Regulation.

(b) An Application shall be in the form specified in Schedule I of this Regulation and shall contain the information specified therein. The Application form shall be obtained from the office of the Commission or downloaded from the Commission's website.

(c) An application for a permit shall be addressed to the Secretary, and delivered by hand or sent by regular mail or courier to the Commission's headquarters.

(d) An application shall be signed and dated by the applicant or authorized representative of the applicant.

(e) An Application shall be submitted in three paper copies and an electronic version in Microsoft Office software format.

(f) All applications for permits must contain all the information specified in the Application form.

4. Application Fee

The Applicant shall upon submission of the Application form, pay a non-refundable fee as may be fixed by the Commission for the processing of the Application.

5. Acknowledgement of Application

On receipt of the Application, the Commission shall note thereon the date of its receipt, and shall send to the Applicant an acknowledgement stating the date of receipt.

6. Evaluation of the Application

(a) The Commission shall evaluate the Application, and may require the Applicant to furnish, within a specified period, any additional information; provided that the time between the receipt of the Application and the accompanying documents and date on which the Commission notifies the Applicant of the inadequacy of the documents and information shall not exceed one month.

(b) If the Commission finds the Application to be complete, it shall certify that the Application has been duly made and is ready for consideration for issuance of a permit. The Commission shall acknowledge to the Applicant in writing that the Application has been duly made within thirty (30) days of the receipt of the complete Application.

7. Approval or Refusal of Permit

(a) After due consideration of the Application, the Commission shall issue or refuse to issue the permit.

(b) The period between the acknowledgement of receipt of the Application as specified in Clause 6(b), and the date on which the Commission notifies the Applicant of its decision or proposed decision to approve or refuse the permit as the case may be, shall not exceed 3 (three) months.

(c) Where the Commission has approved a permit, the Commission shall inform the Applicant of such approval and the conditions to be satisfied, including the fees to be paid before the grant of the permit.

(d) If the Commission intends to refuse the issuance of a permit, it shall notify the Applicant in writing of its intention stating the reasons for the decision.

(e) The Applicant shall have the opportunity to make adequate representations to the Commission within twenty-one (21) days of the Applicant's receipt of the notification from the Commission of the refusal of a permit.

(f) The Commission shall consider the representation made by the Applicant and shall, if the representation is unsuccessful, or no representation was made, duly notify the Applicant in writing that the Application for a permit has been refused.

(g) The reasons for refusing the permit shall be clearly stated in writing by the Commission to the Applicant.

CHAPTER III
SURPLUS POWER

8. Generation of surplus power

(a) A Permit holder must apply for, and receive prior written consent of the Commission before supplying surplus power **not exceeding 1MW** to an off-taker.

(b) A Permit holder who intends to supply surplus power **exceeding 1MW** to an off- taker must apply for a generation license in compliance with the provisions of Section 62(2) of the Act.

CHAPTER IV
DISCLOSURE

9. Furnishing of detailed information to the Commission

(a) All Captive Power Plants shall provide annual detailed information to the Commission on the operation of the plant. The documents shall provide information on health and safety standards and procedures in the plant, environmental issues arising from operation of the plant and such other information as the Commission may from time to time request.

(b) The Commission shall have the power to enter and inspect the premises of the captive power facility at any time, to ensure compliance with applicable regulations and the terms and conditions of the permit.

(c) Approval of the Commission must be requested for and obtained prior to any planned major modification to the Captive Power Plant. The Commission's approval or otherwise should be given within 5 working days after the receipt of the request. All other modifications or augmentations of the Captive Power Plants' capacity shall be reported to the Commission within twenty-four (24) hours of the said modification or augmentation.

(d) The Commission shall have the authority to penalize a permit holder for the violation of any of the terms and conditions of the permit, or to cancel such permit in accordance with Chapter VII of this Regulation.

CHAPTER V
ENFORCEMENT AND PENALTIES

10. Enforcement

(a) The Commission shall have the power to determine whether a person is engaging, or is about to engage in a business for which a Permit is required under Clause (3) (a) of this Regulation.

(b) Unless stayed by a court of competent jurisdiction, each permit holder shall duly implement or follow, as the case may be, Commission orders and written notices, notwithstanding that the permit holder has or may intend to take legal action challenging any such order or notice.

(c) The Commission shall have the authority to order any person who contravenes Clause 3 (a) of this Regulation to cease his operations, and to make such other orders, as may be necessary to prevent the continuation or reoccurrence of the contravention.

11. Penalties

Pursuant to Section 94(1) of the Act,

(a) Any person who contravenes any provision of this Regulation hereunder commits an offence and is liable on conviction, where no specific penalty is prescribed therefore:

(i) as a first offender, to a fine not exceeding N100,000.00 (One Hundred Thousand Naira) only or to imprisonment for a period not exceeding 1 (one) year or to both fine and imprisonment.; or

(ii) for subsequent convictions, to a fine not exceeding N500,000.00 (Five Hundred Thousand Naira) only or to imprisonment for a period not exceeding 3 (three) years or to both fine and imprisonment.

(iii) A person commits an offence and is liable on conviction to a fine not exceeding N100,000.00 (One Hundred Thousand Naira) only or to imprisonment for a period not exceeding one year or to both such fine and imprisonment, if he

(iv) fails or refuses to furnish a return or to supply information in the manner and in the time prescribed or furnishes a false or incomplete return or supplies false or incomplete information; or

(v) willfully delays or obstructs an inspector or police officer in the exercise of the powers or duties conferred or imposed upon him by or under this Act; or

(vi) fails or refuses, without reasonable cause, to give information to an inspector or a police officer when required to do so under Section 95 of the Act or gives false or incomplete information;

CHAPTER VI
AMENDMENT AND RENEWAL OF PERMIT

12. Amendment of Permit

(a) The terms and conditions of a permit may be amended;

(i) on Application by the permit holder;

(ii) upon the Commission receiving a complaint from any consumer, eligible customer, consumer association, association of eligible customers, licensee or other permit holder;

(iii) on the Commission's own initiative.

(b) Unless otherwise specified in writing by the Commission, each Application for an amendment made by the permit holder shall be accompanied by a receipt of such fees as may from time to time be prescribed for processing the Application.

(c) An Application for the amendment of a permit granted by the Commission shall be in the form specified in Schedule II.

13. Renewal of Permit

(a) An Application for the renewal of a permit granted by the Commission shall be made at least three (3) months before the expiration of the permit and shall be in the form specified in Schedule III.

(b) Unless otherwise specified in writing by the Commission, each Application for renewal shall be accompanied by a receipt of such fees as the Commission may prescribe for processing the Application.

(c) The procedure prescribed in Chapter II, in so far as it can be applied, shall be followed while dealing with an Application for renewal of permit.

CHAPTER VII
CANCELLATION OF PERMIT

14. Procedure for Cancellation of Permit

(a) The Commission may on its own initiative or upon receiving a complaint or information from any consumer, eligible customer, consumer association, association of eligible customers or other permit holders, initiate an inquiry into the conduct or functioning of any permit holder.

(b) The Commission may cancel a permit if it is satisfied that:

(i) the permit was issued through fraud or the misrepresentation or non-disclosure of a material fact; or

(ii) the permit holder has willfully or unreasonably contravened any provisions of this Regulation that is applicable to the permit holder; or

(iii) the permit holder has failed to comply with any term or condition of the permit the breach of which is expressly declared to render it liable to cancellation;

(iv) the permit holder becomes insolvent or is adjudged bankrupt; or

(c) The Commission, if satisfied that enough grounds exist for the cancellation of the permit, shall give notice of proceedings for the cancellation of the permit to the permit holder and to such other persons, group of persons or body as it may consider necessary.

(d) The proceedings by the Commission on the cancellation of the permit, in so far as it is applicable, shall be in the manner prescribed by the Commission provided that:

(i) The Commission shall notify the permit holder in writing of its intention to cancel the permit and the reasons for doing so and;

(ii) The permit holder shall be given the opportunity to demonstrate, within sixty (60) days of the delivery of such notification, that the circumstances have changed such that the cancellation may no longer be warranted.

15. Decision on Cancellation of Permit

(a) If the Commission decides to cancel the permit after complying with the laid down procedure, the Commission shall serve notice to the permit holder specifying the effective date from which the Permit holder shall cease further operations of the captive generation plant.

(b) The Commission may instead of cancelling the permit, pass any other order imposing further terms and conditions subject to which the permit holder is permitted to operate thereafter.

CHAPTER VIII
MISCELLANEOUS

16. Rehearing and Appeals

(a) Any person who is aggrieved by a decision of the Commission not to issue a permit; a refusal by the Commission to renew a permit; any amendment of a

permit or a refusal by the Commission to amend a permit; or the cancellation of a permit, may apply to the Commission for review of the Decision, Order or Refusal, within thirty (30) days of the decision, Order or refusal.

(b) The Commission shall in accordance with its Rules of Proceedings reaffirm, reconsider, vary or rescind its decision before issuing a final Order.

(c) Such review or reconsideration shall be completed within sixty (60) days of the date it is requested.

17. Withdrawal of Applications

(a) An Application for a permit may be withdrawn in writing by an Applicant at any stage.

(b) Applications which have been withdrawn cannot be reactivated; provided however that such an Application may be resubmitted as a new Application and a new Application fee shall be charged accordingly.

18. Amendment or Repeal of Regulations

The Commission may amend or repeal the provisions of these Regulations.

THE COMMON SEAL OF NIGERIAN ELECTRICITY REGULATORY COMMISSION

Was affixed pursuant to the ORDER OF THE COMMISSION On this 15th day of October, 2008.

_____
CHAIRMAN/CEO

Schedule I

NIGERIAN ELECTRICITY REGULATORY COMMISSION
APPLICATION FOR PERMIT FOR POWER GENERATION

(Pursuant to S.70 Electric Power Sector Reform Act, 2005)
(BY NERC)

IMPORTANT NOTE: Your Application is **incomplete** unless all required documents are submitted and the application is *accompanied by the appropriate processing fee.*

1 PARTICULARS OF APPLICANT

1.1 Applicant Information

Name: _____
Physical address: _____

Postal address: _____
Tel: _____
Fax: _____
Mobile Phone: _____
E-mail: _____
Website Address: _____

1.2 Contact Person Information

Name: _____
Physical address: _____
Postal address: _____
Tel: _____
Fax: _____
Mobile Phone: _____
E-mail: _____
Website Address: _____

2 LEGAL STATUS OF APPLICANT

2.1 Indicate legal status of Applicant (Tick relevant option)

1. Sole Proprietorship
2. Partnership
3. Public Limited Liability Company
4. Private Limited Liability Company
5. Cooperative Society
6. Other (please specify)

Attach Certificate of Registration, Certificate of Incorporation, Memorandum and Articles of Association, Deed of Partnership, Deed of Trust, as applicable)

2.2 List and Particulars of Shareholders

Name	Address	Nationality	Country of usual residence

3. NATURE OF PERMIT

3.1 State whether Application is a fresh Application or Renewal

3.2 State whether Applicant has an existing permit issued by the Commission or any Authority.

_____

3.3 If the answer to 3.2 is yes, state the nature of the permit, date issued and the permit number.

_____
_____

3.4 Has the Applicant ever been denied a permit or had its permit suspended or revoked by the Commission?

_____

3.5 If yes, give details of the denial, suspension or revocation.

_____
_____
_____
_____

4. MAIN BUSINESS ACTIVITIES OF APPLICANT

Please indicate the main business activities the Applicant is currently engaged in.

_____
_____

(Please attach Tax Clearance Certificate for the immediate past three years)

5. TECHNICAL CAPACITY

Please provide detailed statement of Applicant's technical competence to operate the Power Plant. (Attach CVs of key technical personnel.

_____
_____
_____
_____

6. DESCRIPTION OF POWER PLANT

6.1 State Plant type

_____

6.2 State total capacity of Power Plant.

_____

6.3 Location of the Power Plant.

_____

(Please attach a detailed Schedule of Plant sizes and locations if applying for more than one location).

6.4 Is the Power Plant new? If no, please state number of years the plant has been in operation.

_____

(Please note that NERC reserves the right to verify the accuracy of this information)

7. TECHNICAL DATA

7.1 Name Plate information and other relevant details:

(a) Installed Capacity:

(b) Fuel Type:

(c) Rated Power Factor:

(d) Reactive Power Capability:

(e) Noise Level (State distance from Power Plant):

(f) Output Voltage:

(g) Unit Frequency:

(h) Unit Efficiency:

(i) Date of Installation:

(j) Make and Serial Number of Generator:

(k) Date of Manufacture of Generator (Please provide single line diagram of the Power Plant showing the cable sizes and protective devices):

7.2 Please attach the Environmental Impact Assessment Approval. Where EIA is not applicable, give detailed information on effluents and discharges and how they will be managed.

8. DECLARATION BY THE APPLICANT

The project is not unlawful or contrary to the interest of the Federal Republic of Nigeria. I/we hereby declare that the details stated above are, to the best of my/our knowledge, true and correct.

Dated this _____ day of _____20_____,

THE COMMON SEAL OF THE WITHIN NAMED APPLICANT

_____
(Name of Applicant)

Has hereunto been affixed in the presence of:
Sign: _____ Sign: _____

Name: _____ Name: _____
MANAGING DIRECTOR/CEO **SECRETARY/LEGAL ADVISER**

Sworn to this_____ day of _____ 200_____ at _____

BEFORE ME

_____
NOTARY PUBLIC/COMMISSIONER OF OATHS

==========

FOR OFFICIAL USE ONLY

1. Date of submission of Application _____
2. Fees Paid and Receipt Number _____
3. Results of Verification for completeness

_____
_____
_____

4. Newspapers and Dates in which Application is advertised:

_____
_____

5. Results of any Public Hearing

_____
_____

6. Recommendation NERC Legal/Licensing Division

_____

_____

7. Decision of NERC _____

8. Issuing date _____

9. Expiration date _____

10. Other Relevant information

_____

_____

APPENDIX 8

GENERAL QUESTIONNAIRE

(Data Collection for the Development and Construction of the Plant)
(BY MDACI/CKD ENERGY)

1. GENERAL INFORMATION

1.1. Project specifications

CUSTOMER:

PROJECT NAME:

PLANT:

PLANT LOCATION:

UNIT:

ADDRESS:

Contact persons (surname, name, tel., e-mail):

Responsible project manager:

Person responsible for economical matters:

Person responsible for technical matters:

Comments:

1.2. Authorization

Authorization of the investor to build Power Plant of certain type and output.

Yes ☐ No ☐

1.3. Environment Impact Analysis

Is EIA (Environment Impact Analysis) elaborated by the investor and approved by state authorities?

Yes ☐ No ☐

1.4. Time Schedule

Expected Time Schedule for Design and Project Implementation including necessary approvals from authorities.

1.5. Scope of Facilities

Indicate the type of each onsite process, utility and offsite/support facilities to be included in this project.

1.6. Lifetime

The plant is designed for ☐ years of operation.

1.7. Provision for Future Expansion

Yes ☐ No ☐

If yes, please specify:

2. SITE INFORMATION

2.1. Location of Site

Details on Location:

Country:

Province:

Latitude:

Longitude:

Reference to area map and site plot:

Dwg:_____

Dwg:_____

Dwg:_____

Geological information:

Ground solidity:_____

Ground water (quality and level):_____

2.2. Site Conditions

General description of the current state of the site:

Existing buildings, units or components inside of the plant area, see:

Dwg:_____

Dwg:_____

Existing or expected constraints in areas surrounding the plant:

_____

Current site elevations:

TOP of FLOOR:_____

Reference to topographic survey:

Dwg:_____

2.3. Access Facilities to Site

Airport:	name:	_____
	distance away:	_____
	international classification:	_____
	handling capacity:	_____
	facilities:	_____
Harbour:	name:	_____
	distance away:	_____
	handling capacity:	_____
	facilities:	_____
Railway:	passenger traffic to:	_____

goods traffic to: _____
max. vertical dimensions: _____
max. allowable length of railcars: _____
max. allowable loads: _____
max. contour diagram: _____
max. /min. radius: _____

Roads: description: _____
max. allowable load: _____
max. vehicle length: _____
max. vertical dimensions: _____
max. width: _____

2.4. Reference Level

All elevations are referred to 0.00 (high point of paving)
which is at elevation _____ m above

☐ mean sea level

2.5. Climatic Data

2.5.1. Dry Bulb Air Temperature Data

a.	Highest maximum on record	_____	°C
b.	Hottest month average of max. temperatures	_____	°C
c.	Summer average mean	_____	°C
d.	Annual average mean	_____	°C
e.	Lowest minimum on record	_____	°C
f.	Coldest month average of min. temperature	_____	°C
g.	Winter average mean	_____	°C
h.	Lowest five days mean	_____	°C
i.	Lowest one-day mean	_____	°C
l.	Number of days with average temperature below 0°C	_____	days

2.5.2. Wet Bulb Air Temperature Data

a.	Annual mean	_____	°C
b.	Raining season mean	_____	°C

c. Dry season mean _____ °C

2.5.3. Design Temperature

a. Minimum Design temperature _____ °C

b. Maximum Design temperature _____ °C

2.5.4. Relative Humidity

a. Coldest month mean _____ % at _____ °C

b. Warmest month mean _____ % at _____ °C

c. Winter average mean _____ % at _____ °C

2.5.5. Wind

a. Direction of prevailing wind is from the (season or month): _____

b. Minimum recorded wind velocity sustained _____ km/h

c. Average recorded wind velocity sustained _____ km/h

d. Maximum recorded wind velocity sustained _____ km/h

e. Wind for structural design velocity _____ m/s

2.5.6. Rain

a. Maximum rainfall recorded in 15 minutes is _____mm

b. Maximum rainfall recorded in 20 minutes is _____ mm

c. Maximum rainfall recorded in 30 minutes is _____ mm

d. Maximum rainfall recorded in 1 hour is _____ mm

d. Maximum rainfall recorded in 24 hour is _____ mm

f. Design rainfall for sewer _____ mm

2.5.7. Earthquake

a. Seismic zone _____

b. Importance factor _____

c. Soil coefficient _____

d. Ground acceleration _____ m/s^2

2.6. Special Environmental Conditions

☐ Slightly corrosive

☐ Highly corrosive

☐ Salt

☐ Dust storms

☐ Fog

☐ Other:

2.7. Environmental and Safety Requirements

Please state the following:

a. Maximum noise level at 1m from equipment: _____ db(A)

b. Maximum noise level at work place: _____ db(A)

3. POWER PLANT DATA

3.1. General Information

Type of main fuel of Thermal Power Plant (Coal, Natural Gas, Fuel Oil, etc.):

_____

Set out if with gas turbine, steam turbine, combined, etc.:

_____

_____

Indicate if new power station or extension of the existing one is considered. In case of extension of the existing power station the brief descriptions general layout, thermal scheme and single pole electrical scheme are required:

_____

_____

_____

_____

_____

Requirements for equipment composition used for electricity generation:

_____

Required minimum Plant efficiency:

Specification and distance of Power Plant connecting points for:

Fuel:

Natural gas:

Fuel oil:

Other:

Electrical network:

Raw Water:

Liquid Wastes:

Start up & Shut down Philosophy Description
Describe simply in a few sentences the philosophy of start up (it is from own diesel-set or from grid system. Indicate the voltage and output available from grid system) and shutdown of the unit; define interdependences with other units and necessary sequence to keep:

3.2. Power Plant Output

Electrical output	MW	
Total heat output, including:	MW	
Steam flow rate:	t/h (MW)	
Steam temperature:	°C	
Steam pressure:	MPa(g)	
Hot water flow rate:	t/h (MW)	
Hot water temperature:	°C	
Required voltage and frequency at the generator terminals:	kV / Hz	

(For detailed parameters see 4.1.)

3.3. Power Plant Configuration

Anticipated quantity of units and unit output:	Quantity x MW	
Anticipated quantity of boilers and unit heat output	Quantity x MW	
Anticipated quantity of power units operating hours per a year	Hour	
Anticipated quantity of boilers operating hours per year	Hour	

3.4. Operating Modes of Power Station

Power Plant planned mode of operation:	**Peak/base load/other**	
Electricity output into an isolated network (autonomous operation):	Yes / No	
Major power plant customers:		
Maximum unit consumption of customer:	MW	
Electrical output into collective energy system (operation in parallel with other power plants):	Yes / No	
Steam consumption for technological purposes (average)	t//h	
Steam consumption for technological purposes (maximum during 24 hours)	t/h	
Required pressure of technological steam	MPa(g)	
Shut-down Period		

3.4.1. Annual Electricity Production By Months

	Month	MW*h/month	Ambient air temperature (according to statistics), t_N, °C
1.	January		
2.	February		
3.	March		
4.	April		
5.	May		
6.	June		
7.	July		
8.	August		
9.	September		
10.	October		
11.	November		

12.	December		
TOTAL 1-12:			

3.4.2. Annual Steam And Hot Water Production – Flow rate by months (MW)

	Month	Heating needs	Hot water supply	Production needs	
				Steam	Hot water
1.	January				
2.	February				
3.	March				
4.	April				
5.	May				
6.	June				
7.	July				
8.	August				
9.	September				
10.	October				
11.	November				
12.	December				
	TOTAL 1-12:				
Gas consumption for heat generation, '000.0 Nm^3/h (kg)					

3.5. Main Equipment Design

	Indoor	Semi-outdoor	Outdoor
Boilers			
Turbine-generator sets			
HV and LV switch-gears			

3.6. Data On Electrical Equipment

New integrated switchgear/Use of existing integrated switchgear:		
Need of auxiliary transformer supply:	Yes / No	
Presence of DC supply:	Yes / No	
Existing DC supplies - voltage, output:	V / kW	
Maximum power consumption of existing equipment from DC supplies:	kW / V	

Main electrical diagram:		Provide if possible
Other information on the electrical equipment:		

4. PROCESS MEDIA AND UTILITIES

4.1. Steam

Fill in required data for Steam (if applicable).

4.1.1. High Pressure Steam

	Moisture (%)	Pressure (MPa(g))	Temperature (°C)
Minimum			
Normal			
Maximum			
Design			

4.1.2. Medium Pressure Steam

	Moisture (%)	Pressure (MPa(g))	Temperature (°C)
Minimum			
Normal			
Maximum			
Design			

4.1.3. Low Pressure Steam

	Moisture (%)	Pressure (MPa(g))	Temperature (°C)
Minimum			
Normal			
Maximum			
Design			

4.2. Water

4.2.1. Hot Water

Fill in required data and all other properties for Hot Water (if applicable).

	At power station inlet	At power station outlet
Temperature (°C):		
minimum		
normal		
maximum		
design		
Pressure (MPa(g)):		
minimum		

normal		
maximum		
design		

Hot Water Analysis:

QUALITY Parameter	Content
SiO_2 (mg/l)	
Electric conductivity @ 25 °C (S/cm)	
Total Fe ions (mg/l)	
COD (mg/l)	
Latent alkalinity (mval/l)	
Total alkalinity (mval/l)	
Total hardness (mval/l)	
pH	
Other:	

4.2.2. Raw Water

	Pressure at source (MPa(g))	Temperature at source (°C)
Source		
Minimum		
Normal		
Maximum		
Design		

Normal flow rate (m^3/h): _____

Maximum available flow rate (m^3/h): _____

Raw Water Analysis

		Minimum	Maximum	
Cations	Calcium			ppm as $CaCO_3$
	Magnesium			
	Sodium			
Anions	Bicarbonate			
	Carbonate			
	Hydroxide			
	Chloride			
	Sulfate			
Total Hardness				
Alkalinity A	Methyl Orange			ppm as $CaCO_3$
Alkalinity B	Phenolphthalein			
Iron (total)				ppm as Fe
Silica				ppm as SiO_2
Organic Matter ($KMnO_4$ consumed)				
pH				
CO_2				
Heavy Metal				
Turbidity (and system used)				
Colour (and system used)				
Total Dissolved Solids				

Describe any seasonal variation:

_____

_____

4.2.3. Drinking Water

	Pressure at source (MPa(g))	Temperature at source (°C)
Source		
Minimum		
Normal		
Maximum		
Design		

Normal flow rate (m3/h): _____

Maximum available flow rate (m3/h): _____

4.3. Air and Inert Gas

4.3.1. Plant Air, Instrument Air and Nitrogen

	Description		Instrum. Air	Service Air	Nitrogen
1	Source				
2	Type				
3	SpGr (Air = 1)				
4	Pressure: min.	MPa(g)			
5	norm.	MPa(g)			
6	max.	MPa(g)			
7	Minimum Pressure (1)	MPa(g)			
8	Design Pressure	MPa(g)			
9	Temperature: min.	°C			
10	norm.	°C			
11	max.	°C			
12	Minimum Temperature (1)	°C			
13	Design Temperature	°C			
14	Dew Point at MPa max.	°C			
QUALITY					
15	Nitrogen Purity	Vol.% min.			
16	Carbon Dioxide	ppm max.			
17	Carbon Monoxide	ppm max.			
18	Hydrocarbons	ppm max.			
19	Oxygen	ppm max.			
20	Noble Gases	ppm max.			
21	Water	ppm max.			

(1) At emergency conditions (for design valve actuators).

4.4. Fuels

Main fuel: _____

Reserve fuel: _____

4.4.1. Transport of Fuels

Transport of fuel into the power station (description- Railway wagons, tonnage, bottom or side tilting, indicate type of wagon or enclose sketch. Boat transport; gas line; conveyor transport from mines, etc. Tank truck or wagon tank):

Main fuel: _____

Reserve fuel: _____

4.4.2. Fuel Oil

Percent Aromatics:

Description			Fuel Oil
1	Source		
2	Density at._ Temp & __Press.	kg/m³	
3	Location where Pressure is Specify		
4	Supply Pressure: min.	MPa(g)	
5	norm.	MPa(g)	
6	max.	MPa(g)	
7	Design Pressure	MPa(g)	
8	Return Pressure: min	MPa(g)	
9	norm.	MPa(g)	
10	max.	MPa(g)	
11	Design Pressure		
12	Minimum Temperature: min.	°C	
13	norm.	°C	
14	max.	°C	
15	Design Temperature	°C	
16	°API		
17	Net Heating Value	kJ/kg	
18	Viscosity at _____ °C	mPa·s	
19	Viscosity at _____ °C	mPa·s	
20	Fouling Factor	m² °C/W	
21	Flash Point	°C	
22	Pour Point	°C	
23	Sulphur Content	wt. %	
24	Aromatics Content	wt. %	
25	Nickel Content	wt. ppm	
26	Vanadium Content	wt. ppm	

27	Sodium Content	wt. ppm	
28	Ash Content	wt. ppm	

Note: State viscosity at a minimum of 2 temperatures.

4.4.3. Natural Gas

	Description		Fuel Gas
1	Source		
2	Density at. Temp & Atm.Press.		
3	Density at Norm. Temp.&Press.	kg/m³	
4	Location where Pressure is Specify		
5	Supply Pressure: min.	MPa(g)	
6	_____ norm.	MPa(g)	
7	_____ max.	MPa(g)	
8	Design Pressure	MPa(g)	
9	Minimum Temperature	°C	
10	Normal Temperature	°C	
11	Maximum Temperature	°C	
12	Design Temperature	°C	
13	Low Heating Value (LHV)	kJ/kg	
14	High Heating Value (HHV)	kJ/kg	
15	Viscosity at _____ °C	mPa .s	
16	Viscosity at _____ °C	mPa .s	
17	Fouling Factor	m² C/W	
18	Dew Point at MPa	°C	

Note: State viscosity at a minimum of 2 temperatures.

Natural Gas Composition

Description				Fuel Gas		
				Average	Min	Max
1	Hydrogen	H_2	vol%			
2	Nitrogen	N_2	vol%			
3	Carbon Monoxide	CO	vol%			
4	Carbon Dioxide	CO_2	vol%			
5	Methane	CH_4	vol%			
6	Ethane	C_2H_6	vol%			
7	Ethylene	C_2H_4	vol%			
8	Propane	$C3H_8$	vol%			
9	Propylene	$C3H_6$	vol%			
10	N-Butane	C_4H_{10}	vol%			
11	Isobutane	C_4H_{10}	vol%			
12	Isobutene	C_4H_8	vol%			
13	nC5		vol%			
14	C6+	____	vol%			
15	_____	____	vol%			
16	_____	____	vol%			
17	H_2S		vol%			

18	Water		vol%			
	TOTAL					
	Molecular Weight					

Note: State variation expected in molecular weight, heating value, etc.

4.5. Effluents

4.5.1. Process Waste Water Discharge

Prescriptions for waste water quality from Power Plant:_____

Parameter	Value
Normal discharge flow (m3/h)	
Maximum allowable discharge flow (m3/h)	
Max temperature (°C)	
Pressure (MPa(g))	
Biochemical oxygen demand (BOD) (mg/L)	
Chemical oxygen demand (COD) (mg/L)	
Oil	
Suspended solids	
Total dissolved solids	
Phenols	
Other:	
pH	

4.5.2. Rain Water Discharge

Parameter	Value
Normal discharge flow (m3/h)	
Maximum allowable discharge flow (m3/h)	
Pressure (MPa(g))	
Other:	

4.5.3. Sanitary Water Discharge

Parameter	Value
Normal discharge flow (m3/h)	
Maximum allowable discharge flow (m3/h)	
Pressure (MPa(g))	
Other:	

GLOSARY AND DEFINITION OF TERMS

BG: Bank Guarantee

BTU: British Thermal Unit – Unit of heat equal to the amount of heat required to raise one pound of water one degree Fahrenheit at one atmosphere pressure; equivalent to 251.997 calories

CEMS: Continuous Emission Monitoring System

CLC: Closed Loop Control

CS: Consultancy Services

DC: Direct Current

DCS: Distributed Control System

DIN: Deutsches Institut für Normung e. V. Representative of German interests in supranational standardization

DNV: Det Norske Veritas

EFTZ: Enpower Free Trade Zone. It is called the Enugu Free Trade Zone, being the only existing Free Trade Zone (FTZ) in Enugu and Enugu State.

EIA: Environmental Impact Assessment

EIS: Environmental Impact Statement

EPA: Environmental Protection Agency

EPCI: Engineering, Procurement, Construction and Installation

EU: European Union

FDI: Foreign Direct Investment

FEPA: Federal Environmental Protection Agency

FRN: Federal Republic of Nigeria

GQA: General Quality Assessment

Invested capital means the capital required to implement an investment project, including legal capital and loan capital.

HP: High Pressure

HV: High Voltage

I&C: Instrument and Control

ICC: International Chamber of Commerce

IEC: International Electrotechnical Commission

IEI: ISTROENERGO INTERNATIONAL, A.S.

INCOTERMS: International Commercial Terms (established by the International Chamber of Commerce to define international terms regulating the delivery of technology and work)

IP: Intermediate Pressure

ISO: International Organization for Standardization

JV: Joint-Venture

kV: Kilo Voltage

L/C: Letter of Credit

LP: Low Pressure

LR: Lloyds Register of Shipping

LV: Low Voltage

MDACI: MDA CAPITAL INVEST, A.S. / MDACI CONSORTIUM (the Project Developer)

MV: Medium Voltage

MW: Megawatt

MWe: Megawatt energy (similar to MWh to designate the Plant Capacity)

MWh: Megawatt hour (used to designate the Plant Capacity)

MTD: Metric Ton per Day

MTY: Metric Ton per Year

NDT: Non-Destructive Test

NERC: Nigerian Electricity Regulatory Commission

NIPC: Nigeria's Investment Promotion Commission

NOx: Nitrogen Oxide

NNOH: Number of Operating Hours

OLC: Open Loop Control

O&M: Operations and Maintenance

PAM: Project Administration Manual

PM: Particulate Matter

PHCN: Power Holding Company of Nigeria Plc.

PSI: A unit of pressure, pounds per square inch

QC: Qualifying Certificate

SO_2: Sulphur dioxide

TCC: Total Consultancy Cost

TCN: Transmission Company of Nigeria (operating under PHCN)

TNC: Transnational Corporation

TPC: Total Project Cost

TS: Technical Support or Technical Specification

USD/US$: United States Dollar (Currency of the United States of America)

V: Voltage

VOC: Volatile Organic Compounds