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The Future of West African Gas Pipeline Project on Gas Market Development in the West African Sub Region

(A perspective of Pricing, Third Party Access as well as Financing Risks)

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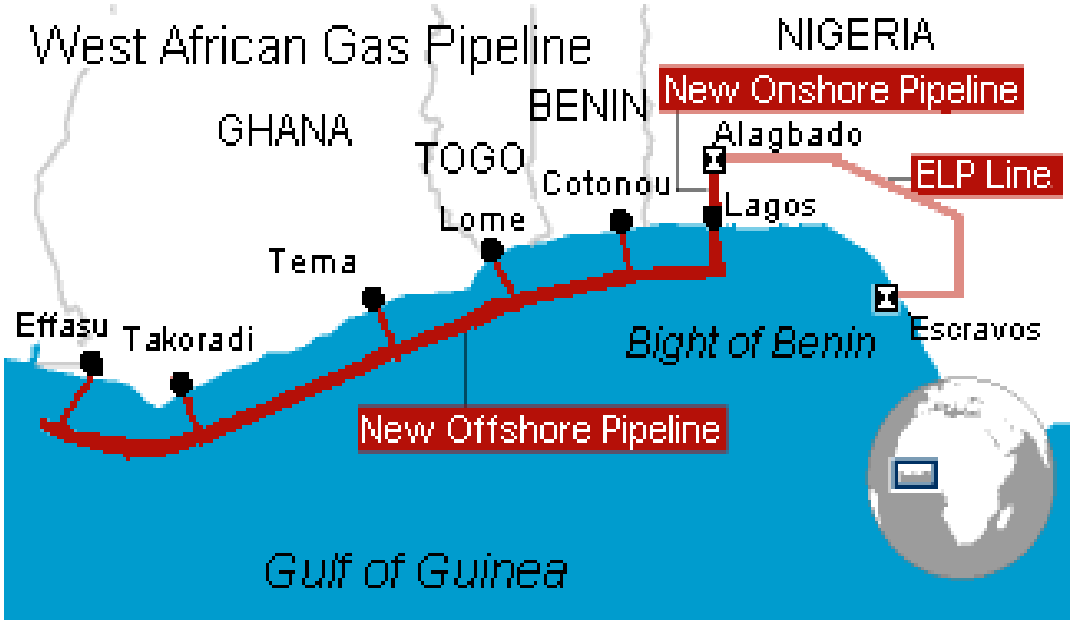

Abstract

Over the years, there has been global interest in the energy sector and its mechanism especially the huge and irreversible capital outlay ploughed into this industry. This interest has been strengthened by pivotal roles played by most energy (oil) producing countries of the world such as Norway, Russia, Saudi Arabia, Venezuela, Iran, Nigeria etc in world economics as well as the advancement in the study of Petroleum Economics.

This thesis examines the future of the West African Gas Pipeline Project on Gas Market development in the West African Sub Region exploring issues of pricing, third party access, finance and financing risk.

I study the characteristics of gas market as a natural monopoly and proceeded to an overview of the nature of the gas industry in some European countries. Subsequently, I look at the theoretical approach to increasing gas supplies with a view to study how there could be varying incentive to invest in new gas capacity and new gas projects. Bearing in mind the role of finance in all this, the financing risk issues are discussed at great length while specific risks in gas projects are brought to light.

The West African Gas Pipeline is also given prominent attention exploring all the issues that could arise during the course and after project completion. I conclude that if the pipeline company has access to supplies from more than one source, it would at least in the simplest cases buy only the cheapest source and the cost of gas from the next cheapest source would effectively put a limit on how much the cheapest supplier could get for his gas.

Preface

This paper is written as a part of my Master of Science in Economics and Business Administration at the Norwegian School of Economics and Business Administration. During the last year of my studies, I have experienced great interest in energy finance Firstly, the Oil and gas industry in Nigeria contributes significantly to the revenue base of Nigerian economy. Secondly, I have followed with keen interest the West African Gas Pipeline project, being the first of its kind in the West African sub region. Natural gas as of today is one of the fastest growing non-renewable energy sources in the world. This is due to the fact that it is very convenient as it can be used by household directly, as fuels in engines as well as fuel in power generation. Investment in gas projects has drawn a lot of attention over the years now as the world focus on reducing CO2 emissions. More so, higher energy prices and clamor for reduction in GHG have made natural gas more attractive as a substitute for oil.

I would like to thank my supervisor Professor **Bjerksund Petter** for his constructive advice during the course of writing as well as his accessibility throughout the work on this thesis. I would also like to extend appreciation to my lecturer in Petroleum Economics, Professor **Røgnvaldur Hannesson**, for his inspiring lecture during the course of my programme.

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CHAPTER ONE

1. INTRODUCTION

Natural Gas is a fossil fuel like oil and coal, produced as a result of chemical reaction under the earth crust in the remains of some organic material from earlier ages. Today, natural gas is the third world`s largest energy resource after coal and oil accounting for about 25 percent total primary energy supply.

The demand for gas has been projected to increase over the next decades, mainly from the power sector of the less developed countries as well as the increasing usage to which it may be put. It is projected that gas consumption will double between now and 2030 to the extent that it will most likely replace coal as the world`s second most important energy resource.

Due to the high cost involved in transporting gas which therefore necessitates the need for gas production sites to be close to the consumption areas, gas exports and imports are heavily concentrated in a few countries. Today, only about 28 per cent of gas consumption is traded locally, with pipeline accounting for 75 per cent of total gas movements and Liquefied Natural Gas (LNG) for the rest.

The proven reserves of natural gas have increased steadily over a couple of decades and moved faster than production by a significant margin. Although countries like Russia, Qatar and Iran hold about 57 percent of world`s gas reserves, gas is more widely distributed than oil.

As stated earlier, transportation is a major issue limiting gas movements. There are two ways of transporting natural gas, by pipelines or in tanks in liquefied form. LNG is competitive only where the distances involved are greater than 4,000 kilometers. Transportation by Pipeline on the other hand is an economically cheaper means of transporting large volume of gas. It will therefore continue to play a major role in gas transportation e.g. from North Africa (Algeria) to Russia and growing markets in Europe,

Canada to United States and Latin America These are the centre of gas demand that needs to be supplied adequately as at when due and this is the reason it becomes imperative to continue to construct and lay gas pipelines regionally.

1.1 RESEARCH QUESTION

Throughout the work in this thesis I have sought to answer the following question:

"To what extent will pricing, Third party Access, finance and financing risks involved in the West African Gas Pipeline Project influence the Gas Market in the West African Sub Region?"

The purpose of this thesis is to investigate *why* and *how* pricing, third party access as well as the financing risks in the gas pipeline project may largely influence the international gas market. This thesis intends to explore the risks associated with the gas project as well as effect of third party access on Gas Market in the West African sub-region. That is, whether there are financing risks in gas development projects and its impact on gas import (export) price determination?

1.2 THEORETICAL APPROACH AND ORGANISATION OF CHAPTERS

This research will adopt a descriptive methodology in analyzing the issues and describing the data in order to draw a far reaching conclusion based on the verifiable evidence to be gathered. Tools like charts, graphs and tables will be employed.

The reason for this choice of approach is that qualitative method helps to provide a thorough, quick as well as an in-depth understanding of the various issues surrounding the subject under consideration which is gas market and gas development project than other approaches. However, the theoretical knowledge gained, in addition to models and quantitative analysis learned in Petroleum Economics and corporate Finance would be brought in when needed to drive home the underpinning of this thesis.

The main sources of information for this thesis have been literature review on the topic as well as a bit of quantitative analysis on Petroleum Economics and Finance.

The organization of this thesis is as follows: The **second chapter** of this thesis discusses a general overview of gas as a classical natural monopoly looking at a simple process of price determination. Furthermore, an overview of the gas market in a few European countries is described to gain an insight into what would be obtainable in West Africa when the gas pipeline project is completed. Then, a theoretical model on increasing gas supplies is presented to anchor on the essence of studying the huge finance and financing risk involved in investing in new gas capacity as well as gas projects. This I am able to relate to the case in hand, the West African Gas Pipeline project. **The third chapter** dwells on institutional framework on issues that relates to gas pipeline project and project entity, state participation, project agreement as well as inter-governmental agreements. **Chapter four** discusses financing, risks associated with project financing as well as specific risks associated with gas project financing. In addition, a finance textbook model on asymmetric information between management of a company and potential investors is presented and applied to my case study. In **chapter five**, with chapter two, three and four in mind, I present the West African Gas Pipeline Project exploring all the issues involved. I analyze the case of a single producer of gas which in this case will be Nigeria delivering gas to a gas transmission company in other countries (involved in the West African Gas Pipeline Project) which in turn sell the gas to many local distribution companies. Finally, I draw the concluding remarks in **chapter six**

CHAPTER TWO

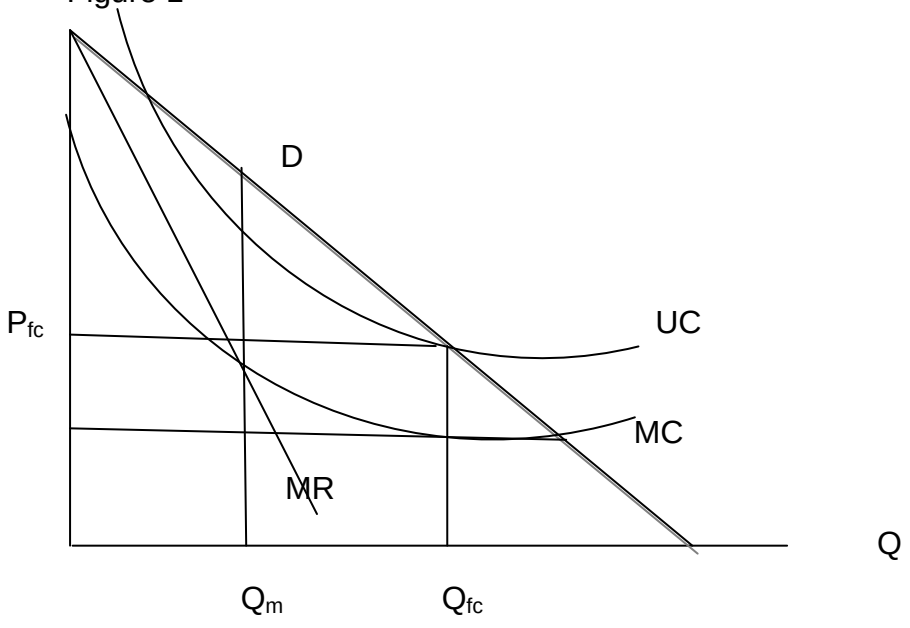
2 GAS MARKET AS A NATURAL MONOPOLY

The huge capital costs of transporting gas have two implications for industrial structures. First, gas producers in Europe, Latin America and Africa have been reluctant to develop gas fields because they often fail to secure a long term commitment from buyers and in most cases, a joint venture in building the necessary transportation systems for gas movement.

Second, the huge capital costs involved in pipelines and LNG systems make them a classic natural monopoly case. Most of the cost of transporting gas in a pipeline is fixed capital cost as the marginal cost of increasing gas flow is somewhat low. This natural monopoly case is enhanced by the fact that pipelines display increasing returns up to a point; pipeline cost are roughly proportionate to the radius of the pipeline while transportation capacity is nearly proportionate to the radius cubed.

A natural monopoly is said to exist if it is less costly to satisfy demand with only one company in the market than with two or more firms. The natural monopoly as result of increasing return to scale causes poses a well known economic problem which can be described using Hannesson Petroleum Economics textbook diagram on monopoly.

Figure 1



A monopolist sets a price where marginal revenue (MR) equals to the marginal cost. This implies a higher tariff than the full cost solution and less volume of gas transported (Qm instead of Qfc) and excludes still more units for which willing buyers of gas are ready to pay additional transportation cost.

For the monopolist to solve this problem, it becomes imperative to apply a double pricing where one part is payment for access to pipeline and the other, payment for off-take of gas. This tariff structure can in principle recover the huge capital cost without necessarily discouraging the transportation of gas for which buyers are willing to pay the marginal cost. However, this high cost may not be easily defrayed as most pipeline construction and transnational gas project have long gestation period due to infrastructural requirements and different stages of development

2.1 OVERVIEW OF GAS MARKET IN CONTINENTAL EUROPE

ITALY

The Italian gas market ranks as the third largest market in Europe. Gas production in Italy is mainly controlled by ENI through its Exploration and Production division with a number of small producers. The structure of the Italian gas market is such that under the decree 2000, ENI and its smaller competitors are required to undertake corporate separation of their gas operations into production and imports, transmission and storage as well as distribution and sales. By the report of IEA, it is projected that existing infrastructures will not be able to meet forecast growth in Italian gas. At the moment the majority of the country`s gas demand is met by imports and gas prices are significantly higher than the European average creating opportunities for new players and those looking to expand their presence.[1].

[1] www.globalbusinessinsights.com/content/rbmk0002m.pdf

GERMANY

The German gas market is organized under civil law and takes place largely at three levels:

- Import and production
- Transportation and distribution
- Regional distribution/distribution to end users

The German gas market is made up of some 750 independent companies. Production companies and cross regional companies are charged with supplying natural gas from Germany and beyond to gas companies, households businesses and industry.[2]

Some few years ago, the gas business in Germany was characterized by long term gas purchase contracts linked to the price of oil. Today, the terms for transactions between the transporter and traders are becoming shorter. For gas transport companies, this creates the need to offer the market services for gas transport and gas storage tailored towards customer request.[3]

BELGIUM

Belgium derives almost 40% of its energy needs from natural gas, all of which is imported. Gas consumption has increased about 30% between 1998 and 2009 and a large amount of this increase is due to a sharp rise in gas utilization for electricity generation purpose. Few years ago, Distrigas has monopoly rights to distribute gas to local utilities in Belgium. However, with the liberalization of the Belgian natural gas market, freely chosen supplier could now meet 91.5% of Belgian demand for natural gas. Just like it happened in the case of electricity market, gas companies were divided to avoid conflicts of interest, separating transport and distribution from sales.[4]

[2] http://www.distrigas.eu/content/germany/de-en/natural-gas-de-en/european-market-de-en.html
[3] http://www.moffatt-associates.com/energy_services/forecasting_market_trends/energy

[4] http://www.nam.org/Resource-Center/Export-Promotion/Market-Research/Market-Research/~/media/8E9445F4E8374E16A2CC77E4341CF738.ashx

FRANCE

Today the gas market in France is controlled by Gaz de France (GdF) which directly or indirectly operates at all levels- imports/ wholesales, transmission, distribution and supply.[5] Gaz de France has monopoly rights to import and distribute gas to local distributors. Nearly all the gas is imported in France For most of its supply, the French gas market relies heavily on long term contracts between the incumbent suppliers and national companies.

NETHERLAND

Netherland is a major gas producer and also exports to other member states. Imports from Russia and Norway have been increasing in recent years. In Netherland, a company called Nederlandse Aardolie Maatschappij's (NAM) is one of the largest producers of natural gas and is a subsidiary of Exxon (50%) and Shell (50%). Between 2001 t0 2008, the number of players on the gas wholesale market has increased considerably from about eight to seventy players. The incumbent wholesaler Gas Terra controls around 80% of the available gas.

The Dutch gas retail market consists of three large suppliers who dominate the market and a larger number of small suppliers[6].

[5] http://ec.europa.eu/energy/energy_policy/doc/factsheets/market/market_fr_en.pdf
[6] http://ec.europa.eu/energy/energy_policy/doc/factsheets/market/market_nl_en.pdf

2.2 THEORETICAL MODEL ON INCREASING GAS SUPPLIES

In order to have a thorough understanding of the mechanism involved in gas projects as well as gas supplying capacity, I will briefly present and apply a model from Hannesson (1998). The Hannesson model will be applied to the West African Gas Pipeline project in which only one producer of gas (Nigeria in this case) delivers to a gas transmission company in other countries like Ghana, Togo or Benin which in turn sells natural gas to local distribution companies. Obviously, this is not a true representation in European continent but this case will most probably occur in the West African Gas market once the pipeline project is completed.

To apply this bilateral monopoly scenario, I shall defer the theoretical model till chapter five when the West African Gas Pipeline project would have been fully described.

The Hannesson model also gives an overview of a market with a third party access to a gas pipeline and two sellers. In this hypothetical market, there is one low cost and one high-cost supplier and the model analyze their decision to invest or not to invest in new production capacity.

This thesis uses the model to analyze a situation with one buyer of gas and two types of suppliers. One of the two suppliers has low cost of production while the other has high costs. Owing to security of supply issue, there is a desire not to import more than a certain quantity of gas from the low-cost suppliers even if this was possible. Suppose the low cost/ high risk supplier will consist of Russian piped gas or Algerian gas and potential supplies by Iran. High cost/ low-cost supplier would be EU indigenous supply, Norway (both pipe and LNG). I will assume that the aforementioned two groups act like two players in the market and hence they coordinate their action. Subsequently, I will use the theoretical framework to analyze the impact of investing in new capacity by the supplier as well as the effect of having more buyers of gas.

Let the Demand for natural gas be represented by a linear function.

(1) $P = a-bQ$

I shall assume that transportation is ignored while P is price net of cost.

Due to security of supply issues which will be described later in subsequent chapter, the buyer will diversify its supplies by importing a fixed amount α from the low-cost producers and thus a fixed share 1-α from the high-cost suppliers.

This gives us

(2) $Q_l = \alpha Q$ and $Q_h = (1-\alpha)Q$, where $Q_l + Q_h = Q$

Here Q_l is quantity supplied by low-cost supplier while Q is the given quantity of gas.

It is assumed that α is known and fixed but in the real world this is not often true. In real life, it is most likely that the importing region will have a varying α. The total profit on the gas purchase will be

(3) $P(Q)Q – \alpha QC_l – (1-\alpha)QC_h$

Here, the prices paid to the producers from the importers net out. So, the first order condition (FOC) associated with equation (3) above which represent the maximum profit to be shared gives

(4) $P + P'Q = \alpha QC_l + (1-\alpha)QC_h$

The profit obtained by each group of suppliers will now be

(5) $\Pi_l = Q_l(S_l-C_l)$, $\Pi_h = Q_h(S_h-C_h)$

and the profit obtained by the importer is

(6) $\Pi_{Imp} = Q_l(P(Q) - S_l) + Q_h(P(Q) - S_h)$,

If I assume the importer and the producer will share profit equally, then we would have

(7) $S_l = C_l + ½ (P-C_l)$, $S_h = C_h + ½ (P-C_h)$

If we use values to represent the variables as follows a=10, b=0.5, C_l=2, C_h=4, and α=0.5, we get Q=3.5, P=6.5, S_l=4.25 and S_h=5.25

Clearly, the price paid to the producers will be in the range of 4.25 to 5.25 and there is a substantial price difference. This price difference exists because of the obligation to diversify imports. This means as long as this obligation is in place, one may observe that importing countries like Spain may be more willing to pay more for liquefied natural gas from say a country like Norway than LNG or piped gas from Algeria.

A significant price difference shown in the analysis above will give greater but different investment incentives to invest in gas projects in different regions. Producers who are considered safe suppliers may invest in gas projects with higher costs than producers who are not considered safe suppliers because the safe suppliers can charge a higher price for gas.

I will now consider several propositions or scenarios in order to expatiate on the above analysis.

Proposition 1- What if the gas market is liberalized?

This means more players are now allowed to import gas and the obligation to buy 50% of the total quantum from each supplier is relaxed. This can be said to be partly what has happened in Europe recently with liberalization and deregulation of the gas market, entrance of new importers and the relaxation of import restriction on Russian gas.

To analyze this, it is necessary to classify the competition between two groups of suppliers. The conventional classification separates between whether price or quantity is the decision variable. Assuming price is the decision variable (Bertrand competition),

the low cost producers will reduce their price to a level slightly below the marginal cost of the high cost producers, thus capturing the market. By implication, the only way for the high-cost suppliers to be in the market will be for reasons of diversification, as there will not be any room for him to operate until the low-cost suppliers have exhausted his reserves. This type of competition assumes that the low-cost suppliers have the capacity to supply the needed quantity at a fixed marginal cost. This assumption is not however feasible in reality.

The other type of competition involves using quantity as the decision variable. This is more likely due to the huge capital cost involved in building new production capacity. With quantity as decision variable, each group of producers will now decide how much gas to supply taking into consideration the amount of gas that will be supplied by the other group of suppliers. In this case, there will be no price difference between the two groups of suppliers as there is no supply constraint. Two situations will therefore apply here, one will be where both group of supplier make their decisions simultaneously (Cournot competition) and the other situation will be where one of the players has the advantage of being the first to make decision (Stackelberg competition)

For the purpose of this thesis, I will analyze the situation using Cournot competition.

The Revenue (R) of each supplier i is given by multiplying quantity sold by the same supplier quantity (Qi)

(8) $R_i = Q_i - bQQ_i$, $i=l,h$, $Q= Q_l + Q_h$

The marginal revenue (MR) given the quantity supplied by the other supplier is

(9) $a - bQ_j - 2bQi$, $i,j = l,h$, $j \neq i$

For each player, the optimal solution occurs where the marginal cost (MC) equates marginal revenue (MR). To ensure consistency in the solution, the quantity supplied by each player must end up being the same as what the other supplier assumed.

Setting the MR=MC and solving the equations give

(10) $Q_i = (a + C_j - 2C_i)/3b, i,j, = l,h; j \neq i$

The solution in this equation thus gives P=5.33 and Q= 4.67 which consists of Ql= 3.33 and Qh=1.33

Π_l (Profit of the low-cost supplier) will be slightly less than 12 under Bertrand competition and 11.09 under Cournot competition.

As shown the high-cost suppliers will reduce their quantum of supplies while the low-cost suppliers will increase their quantum compared to the situation where buyers are obliged to buy half of their supplies from each supplier. The end result will be an increase in supply of gas as the low-cost suppliers will increase supplies by more than what the high-cost suppliers lower by.

In practice, the high-cost suppliers may lower their supply even more because of waning reserves as well higher cost for the gas that is left.

In the case of the West African Gas Market, this is not the true situation as I shall expatiate in Chapter five. There is no mechanism in place to liberalize the market now as the gas market is still at the developing stage but it is most likely that the proposition presented above will feature in the market when many players are involved.

Proposition 2- What if the supply of gas is treated as finite?

The model adopted in the foregoing analysis treat the supply of gas as being infinite but this not actually true as gas resources is finite in nature. Suppose high-cost suppliers

have 50 units of reserves while low-cost supplier have 100 units. Under the Cournot competition, the low-cost suppliers would like to supply 3.33 units. To do this the low-cost suppliers must expand capacity by 1.58. There is a certain lead time for this expansion project.

The present value of the profit for supplier i can be expressed as equation (11)

$$\int_0^{T_1} P\left(\sum Q_{1,j}\right) Q_{1,i}\, e^{-rt}\, dt + \int_1^{T_2} P\left(\sum Q_{2,j}\right) Q_{2,i}\, e^{-rt}\, dt + \int_2^{T_3} P\left(\sum Q_{3,j}\right) Q_{3,i}\, e^{-rt}\, dt - K_i$$

The notation i represents supplier, either low-cost supplier or high-cost supplier.

T_1= time it takes to build new capacity. Production in this phase is Q_1.

T_2= one player runs out of reserves.

T_3= Here, all reserves gone.

K=present value of investing in new capacity.

K_i= the present value of investment in new capacity by low-cost supplier or high-cost supplier.

The future period here is divided into three (3) phases. The first phase can be described as the time it takes to build the new capacity. The second phase is where the new capacity has come on stream and both the low-cost suppliers and high-cost suppliers will be deemed to producing. In the last phase, the suppliers with the least resources have run out of reserves and there is only one group of suppliers still producing. K is the present value of the investment in new capacity and r is the discount rate. Here, I have ignored operating costs.

We can assume that both the low-cost and high-cost suppliers have the possibility of doubling their capacity at a cost K. The lead time will be five years (T=5) and because expanding production capacity is visible, it is also assumed that both kinds of suppliers will be able to increase capacity simultaneously.

If both kinds of suppliers invest in new capacity, price will decline to 3, while if only one of them invest and expands, the price will be 4.75.Now, if the low-cost suppliers with large reserves choose to expand, their price will be 6.5 in the last period compared with 8.25 if they keep their capacity unchanged.

The figures C_l=2 and C_h=4 which are inserted into equation (7) can be interpreted as the cost per unit per year for the low-cost and high-cost producers respectively. These are thus the break even prices.

Using a discount rate of 0.1, the present value at time zero for an annual production of 1.75 units until the reserves are emptied is 66 for the high-cost suppliers at a price of 4, and 35 for the low-cost producers at a price of 2. If production is starting at time zero and the cost of doubling the capacity is the same as the cost of initial capacity, 66 and 35 would be the values for K for the two kinds of producers. The results for the two suppliers in the four different scenarios can be represented in a payoff matrix as follows.

Table 1

High-cost/Low cost supplier	No investment	Investment
No investment	102.2**;** 115	90.4**;** 103.9
Investment	48.6**;** 106.1	22.8**;** 86.1

Payoff to high cost producers; payoff to low cost producers

The dominant strategy for either supplier would be not to invest regardless of whatever the other supplier does. Even if the pipeline company were obliged to transport gas at a fair rate, the producers will not be interested in supplying anymore and the only effect of liberalization would be to deprive the pipeline company of its share in the profit.

However, this result depends on the total cost of new capacity. If the cost is say 20 and 10 for the high-cost and low-cost suppliers respectively, the pay off matrix result will be as follows

Table 2

High-cost/Low cost supplier	No investment	Investment
No investment	107.2; 115	90.4; 128.9
Investment	94.6; 106.1	68.8; 111.1

Payoff to high cost producers; payoff to low cost producers

In this case, the low-cost supplier will choose to invest while the high cost supplier will refrain from investing. This means that the capacity will increase to 4.25 and the price will fall from 6.5 to 4.75 in the second phase.

This shows that the cost level of new capacity is important and can be critical to investment in new gas projects. This is a relevant and important conclusion as the costs of the LNG chain have declined over the years.

In addition, the analysis above shows that the high-cost suppliers lose when relaxing the security of supply (denoted by α). This is however natural as there would be less incentive to pay more for low-risk suppliers if one is not obliged to do so. With the ever-changing international relations, security of supply may soon in increase in importance and low-risk suppliers might be able to charge a higher price if the market attaches a risk premium from certain sources.

Source: Petroleum Economics by Røgnvaldur Hannesson (1998)

CHAPTER THREE

3 GAS PIPELINE PROJECT AND PROJECT ENTITY

A transnational gas pipeline project is a gas development project that spans across more than one country. There are two forms of transnational gas projects namely: the Liquefied Natural Gas and Pipelines. Cross border pipelines traverse long distances running through another country to deliver oil and gas to markets in third country[7].

The purpose of building a transnational gas pipeline project often determines the type of project entity to be used in carrying out the project. For instance, the purpose could be that the pipeline is an extension of an upstream development provided for the purpose of moving a product to market or is developed as a part of a regional infrastructure by those in the business of building or operating pipelines[8].

Where the pipeline is being developed by the upstream gas owner to move their product to the market, the pipeline is seen as being part of their upstream infrastructure. An unincorporated venture may be used by parties in a production sharing agreement in this instance as the pipeline entity. However, if the pipeline is a transmission infrastructure such that pipeline promoter may or may not have production interest, a limited liability company is likely to be used.

Other issues that may likely affect the type of project entity to be used include:

i. Taxation.
ii. National investment laws.
iii. Requirement for local participation.
iv. The extent of risk and liability protection the sponsors wish to get.
v. The ease with which profit can be extracted by the sponsors.
vi. Flexibility of management structure.
vii. Ease of dissolution.

[7] P. Stevens, *A History of Transit Pipelines in the Middle East: Lessons for the future, 6* (CEPMLP, 1996).
[8] Griffin supra note 10, at 73.

However, where the pipelines cross different countries with separate national laws as it is in the case of transnational project, the pipelines are separated into national parts but linked together under a single agreement.

The selection of the type of project entity will affect the timing of taking relief for expenditures and who may actually take the relief though it will not affect the liability to pay tax on the business venture. A joint venture company will normally have tax liabilities in each country where it passes and be subject to the domestic laws of such territories and the provisions of any applicable Host Government Agreement. A limited liability company will be liable to tax in the jurisdiction where it is resident. If however a non-corporate joint venture is used as a project entity, the venture has no tax distinct from that of the joint venturer.

3.1 STATE PARTICIPATION

The involvement of the state in a transnational gas pipeline project is crucial to give credibility and assurance to the sponsors on matters such as legal security and stability of their investments. This becomes very important especially when the mode of financing the project comes via equity or bond. In most cases, providers of capital will demand for huge commitment from the state to provide extra assurance before parting with fund on the project. The sponsors usually demand to have the right to

i) Acquire title to the asset.
ii) Develop and implement the project.
iii) Import foreign labour.
iv) Operate the pipeline.
v) Repatriate profits and capital.

As most construction of pipelines requires government sanction, the permanent use of land needed for such project also requires state approval. In addition, the likelihood of market failure also brings in government into the picture. The threat of sudden change in law such as taxation law, accounting standards, foreign exchange controls and labour laws must be taken into consideration.

Usually, the state will play two important roles both as a facilitator and supporter of the implementation and operation of the project. The State like any other stakeholder often seeks more direct participation as an equity investor in transnational gas pipeline projects. This is to lend support to the implementation and take off of the project with a view to earning dividend later on.

3.2 PROJECT AGREEMENT

Project agreement for a transnational gas pipeline covers international agreements and treaties, inter-governmental, host government, transportation and financing agreements etc. All these agreements will have a far reaching consequence on gas pipeline project. The project entity and individual participants to the project will not have any input into these agreements as they are strictly state matters.

In addition, there will also be agreement on the production of the gas to be transported through pipeline. Such an agreement may include development and host government arrangement, the grant of concession or the making of production sharing agreements (PSAs). In situation where the owners of the pipelines are not the owners of gas to be transported through the pipeline, then a transportation agreement is needed.

This transportation agreement will be contracted as an agreement between a gas transporter (pipeline owner) and gas shipper (owner of the gas). Also, part of the contents of the agreement will deal with issues such as allocation and priorities within the pipelines. The arrangements for sale and purchase of gas transported through transnational pipeline are normally complex. Such agreements are usually made between the owners of the gas and the state. Where debt funding is involved in the financing of the pipeline project, then further lending agreements between the lenders and sponsors are documented.

3.3 INTER-GOVERNMENTAL AGREEMENTS

Some of the issues that will be dealt with under inter-governmental agreements that are central to the success of any transnational gas pipeline projects include:

i) Identification of the territory of each of the participating states and matters of boundary and other territorial disputes.
ii) Commitment of each participating State to the project.
iii) Protection of investment in each participating State
iv) Granting of land rights and necessary consents and authorization.
v) Commitment to freedom of transit.
vi) Safety and security of the project.
vii) Creation of a fiscal regime in relation to the proposed pipeline and pipeline tariffs and their regulation.

CHAPTER FOUR

4 FINANCING

Energy project such as gas development fields and pipeline construction requires huge capital outlay. Due to the capital intensive nature as well as the riskiness of the project, the need to source for external funds is inevitable. Generally, the mode of financing will be determined by purpose of the project and the nature of the participants. Also the financial and technological means of conducting this crucial task of energy projects have not always been readily or totally available within national border, hence the need for varying degree of external investment and expertise[9].

Basically there are four different approaches to financing a transnational gas pipeline project.

4.1 TYPES OF FINANCING

4.1.1 Equity Financing

This is a form of financing whereby the project sponsors contribute their own fund to carry out the project. Personal fund of the sponsors could be from their internally generated revenue to the extent that they are available. In most cases, only the largest producers in the oil and gas industry can fund large development by means of equity as they have access to capital markets[10].

4.1.2 Debt Financing

This is financing carried out by borrowing either from private investors or banks. The different forms of borrowing used in oil and gas project are[11]:

i) Lease Financing: This occurs when the providers of capital retain both the title and ownership of an asset and then lease the asset out on a long term basis to a

[9] H. Zakaiya, *The Petroleum Lending Program of the World Bank*, 17 Journal of World Trade Law p.471(1983)
[10] D.Winfield, *Oil and Gas Financing Agreements* in Upstream Oil and Gas Agreements 138(1996)
[11] See Winfield supra note 42, at 138.

lessee, usually for the whole life span of the asset. All the risks and rewards of the assets are transferred to the lessee.

ii) Bank loan: This is a facility taken from commercial bank. Large debt facilities are done through a syndicate of banks and this would largely depend on the identity of both borrowers and lenders

iii) Public Bond Issues: Public Bond issues are available in international capital markets, though they are accessible to only large companies with internationally certified credit ratings.

4.1.3 Industry Financing

Industry financing is peculiar to the oil and gas industry as it typically involves transactions between producers as against producers and providers of capital. The common methods are as follows:

i) Net Profit Interest: A contractual agreement is signed on the sale of petroleum to be won from a field. The sale is premised on the agreement that the transferor receives a future share of the field income stream determined by reference to the future performance of the field.

ii) Farm in: In a farm-in-agreement, the transferor sells part of its interest in a particular field to another party prior to the actual commencement of the development of the field. The sale is done on terms and agreement that the transferor fund all or part of the cost of developing the transferor`s retained interest.

iii) Carried interest: This involves one consortium member funding the expenditure of a second member on terms that the first will retain a specified share of the future production entitlement of the second. The specified share will enable the funder to recover the development cost incurred in respect of the carried interest plus a financing charge.

4.2 SOURCES OF FINANCE

There are different ways of financing transnational gas pipeline projects ranging from equity investment, non-recourse loans etc. However, for the purpose of this thesis, finance sources classification shall be broadly divided along two major lines of providers of capital - commercial lenders and commercial sponsors.

4.2.1 Commercial Lenders

i) Banks –commercial and investment banks
ii) Institutional investors
iii) Leasing companies
iv) Savings and loans associations
v) Investment mortgage companies
vi) Money market funds.

4.2.2 Commercial Sponsors

i) International agencies (The World Bank, EBRD)
ii) Government Export Financing Agencies
iii) Companies requiring the product or services
iv) Trade Creditors
v) Contractor

4.3 PROJECT FINANCING

Project Financing has become a major source of finance in the energy industry in recent times. In project financing, a legally independent project company, usually one that builds, or builds and operates, an industrial plant or a piece of infrastructure is set up by other pre-existing companies in commercial sector related to that of the project company[12]. These enterprises invest as shareholders in the project company and are called *sponsors* of the project company.

[12] Kensinger J., & Martin J.D., "Project Finance: Raising Money the Old-Fashioned Way" 1 *Journal of Applied Corporate Finance*, 69 (1988).

Crucially, the project company also relies heavily on loans from banks to get established. These loans supply the bulk of finance for the project company and are secured against the future revenues of the finished project, not against the asset of the sponsors. For example, the oil multinational BP, sometimes with partners, is a sponsor of certain pipeline projects in various parts of the world. If the project company runs into difficulty servicing its debts, lenders have no claims on BP`s assets-project funding is "non recourse"- but BP`s shareholding will decline in value. So while BP and sponsors in general run risks in project finance, the risks arising from unpaid debt are mainly borne by private and public sector banks. Since project companies are largely financed from bank loans, the risk of unpaid debt can be significant. However, private banks would run these risks on the condition that they are *senior lenders*; they are first in the queue for project revenues and also for the proceeds of asset sales for project companies that default on loans.

Project finance is a combination of debt and equity financing. The equity serves as a risk capital in the project to the lenders as well as measure of comfort which gives confidence to the sponsors. The basis for project financing is that the project should be capable of earning sufficient revenue that would serve the project debt and also provide the sponsor with a completely non recourse debt so that it doesn't affect the sponsor`s balance sheet. If however the project debt affect the sponsor`s balance sheet, the negative impact is on the gearing level of the sponsor. This will restrict the ability of the sponsor to have access to the financial market. Project financing is a kind of asset based financing empowers the lenders to have recourse only to the "underlying assets" of the project.

The project`s capacity for a predictable revenue stream is what sustain the project economics and enhances the lenders decision making and provide a reasonable level of assurance. Fundamental to such financing is the lender`s requirement is that the off taker is credit worthy so as to ensure that payments will be made to project company in order to service the interest on the debt and repay the repay the principal amount of the loan.

The size of the capital outlay involved in many projects in the energy industry made project financing a popular option. Even Multinationals are being confronted with financial difficulties and they seek to get the required fund through project finance rather than through traditional means which has proved to be unsatisfactory. Project financing includes features that allow project sponsors to share risk with lenders as compared to corporate or balance sheet lending. It relies on sharing risks between the lenders and other parties in a manner that envisage that the various obligations and risks would be met by the parties best able to bear them.

Project Financing involves both debt and equity where the debt to equity ratio is typically large (as much as 70% debt and 30% equity). It is well known that debt is cheaper than equity; therefore when debt is available, cheap and is the least expensive form of financing, project financing becomes a choice.[13] The revenue from the project before interest, taxes and depreciation must be able to generate adequate returns to equity holders and pay both the interest and the principal on the debt as well as all associated costs. Project finance is essentially about risk-return trade off. It allocates project risk to the parties that are most competent to absorb those risks and ensuring that there are adequate returns to compensate taking the risks. A project is not considered bankable where risks that is crucial and central to the potential earnings of the project have not been identified, allocated and mitigated within the project structure to the lender satisfaction[14].

4.4 PARTIES TO A PROJECT

4.4.1 Project Sponsors

Project Sponsors are similar to initial promoters of a corporate entity who can either be public or private sector sponsors. While public sector sponsor refers to the state or government, the private sectors are mostly individuals, companies or a consortium of both. A project could have just one company or a consortium of interested parties

[13] See Nevitt supra note 43, at 1.

[14] T.H. Donaldson, (ed.), and J Morgan, *The Traditional Approach in Project Lending'* in Project Lending, 4-5(1992).

involving contractors, suppliers, users of the project`s product whose mutual interest is to ensure that the project comes to operation[15]. The objectives of private sector sponsors will include the following:

i) To maximize stockholders` wealth by making adequate returns
ii) To satisfy strategic corporate objective
iii) To diversify their risk portfolio

4.4.2 Project Company

A project company can be described as the economic unit through which the project sponsor is carrying out the project. In most cases, a Special Purpose Vehicle is incorporated depending on the legal and regulatory requirements of the host country. It is also possible that a project company may not be the borrower in project finance depending on the view of the sponsors on issue that bothers on tax consideration, effects of foreign exchange control on the project, availability of security for the project and the enforceability of claims in the host country.

4.4.3 The Lenders

The full cost of an average transnational gas pipeline project is estimated to be about $600m and this makes it difficult for a single lender to be involved. The common practice is for a syndicate of banks to pool the funds needed for the project. The syndicate could consist of foreign banks; local banks, export credit and multilateral credit agencies. In order to mitigate against expropriation risk, a syndicate of banks and multilateral agencies will come together to fund such project. Thus, little or no interference will be allowed from the host government as it is only expected to ensure that revenue earned are used in servicing both the loan interest and principal. Other aims of the lenders will include:

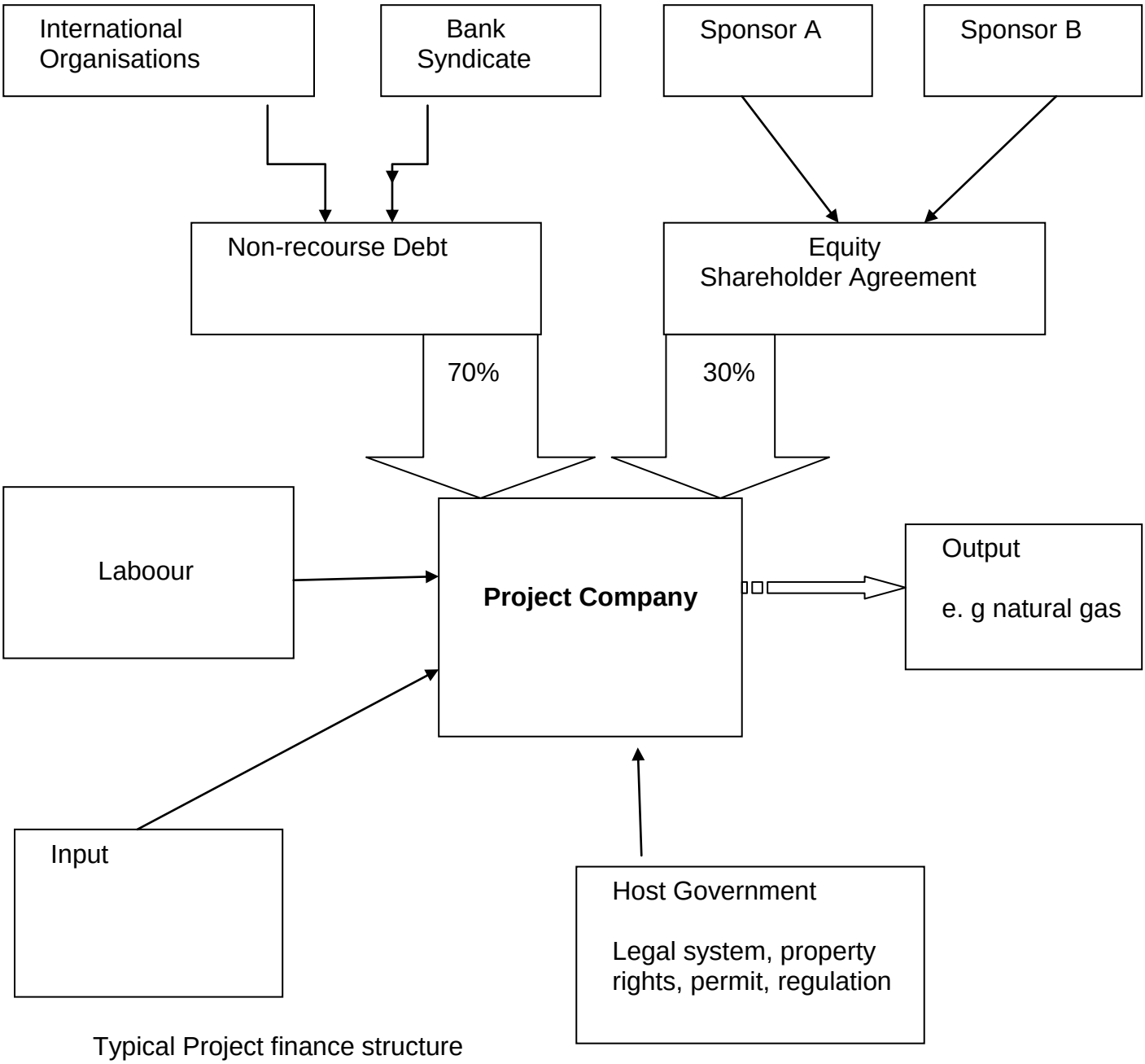
i) To make a profit based on interest charged on the loan
ii) To assume only measurable or measured risks
iii) To have control over key project decisions and ;
iv) To take control of the project as soon as possible in times of hardship.[16]

[15] C. Clifford, Project Finance, 9 (1996).

4.4.4 Host Government

The host government act as a major backer to the project and in most cases does not participate directly in project finance as a borrower to the project even though it might take an equity interest through the state oil company or parastatal. The host government plays a major role in providing support and undertakings, granting of necessary concessions, award of operating licenses, providing fiscal incentives such as tax benefits and could provide foreign exchange availability guarantee.

[16] See Vinter supra note 15, at 4.



Typical Project finance structure

Source: C. Clifford, Project Finance, 9 (1996)

4.5 A SIMPLE MODEL ON SOURCING FOR FINANCE

Here I will apply a simple finance textbook[17] model in a situation where the management of a project company faces a big challenge when raising finance from the market due to asymmetric information. Let us consider a project company that is all equity financed. There are two states in the world, the peach (Good) and lemon (Bad) states. Each state is equally likely. In the peach state, the project company has assets in place with a value of β. In the lemon state, the project company`s asset in place is α.

The project company is seeking to finance a gas pipeline project that cost μ and has an NPV of € in both states. The project company is considering financing the project by issuing equity. Let us assume that the managers of the company know which state the firm is and they seek to maximize value to existing shareholders.

Proposition I

If the project sponsor or investors can identify the state of the project company, the dilution in the peach state will be

$$\Pi^{peach} = \frac{\mu}{\beta + \mu + €}$$

In the lemon state, the fair dilution will be

$$\Pi^{lemon} = \frac{\mu}{\alpha + \mu + €}$$

Π is the dilution factor. Here Π>0.

Let us represent the fair dilution in the peach and lemon state to be Ⓟ and ℓ respectively replacing the above fractions.

[17] Adapted from Brealey, Richard A. og Stewart C. Myers (2008): Principles of Corporate Finance. 9th ed. McGraw-Hill/Irwin, Boston, Mass.

Proposition II

Assume from now that the project sponsors cannot identify the state (they view the two states as equally likely), the market dilution will be

$$\Pi^{market} = \frac{\mu}{0.5(\alpha + €) + 0.5(\beta + €) + \mu}$$

This can simply be denoted by ∂

Proposition III

Let us suppose the project company is in the peach state, the maximum dilution the company would accept is

$$(1 - \Pi^{peach}{}_{max})(\beta + € + \mu) \geq \beta$$

$$(\beta + € + \mu) - (\Pi^{peach}{}_{max})(\beta + € + \mu) \geq \beta$$

$$\Pi^{peach}{}_{max} \leq \frac{€ + \mu}{\beta + € + \mu}$$

For simplicity, let us replace the fraction above with Ω, such that the maximum dilution the project company would accept from the investors in this state is Ω.

Proposition IV

In the same vein, assume the project company is in lemon state, the maximum dilution the company would accept is

$$(1 - \Pi^{lemon}{}_{max})(\alpha + € + \mu) \geq \alpha$$

$$(\alpha + € + \mu) - (\Pi^{lemon}{}_{max})(\beta + € + \mu) \geq \alpha$$

$$\Pi^{lemon}{}_{max} \leq \frac{€ + \mu}{\alpha + € + \mu}$$

Similarly, the fraction above can be replaced with □ for the sake of simplicity.

Analysis

Suppose it turns out that in the peach, the maximum dilution Ω the project company would accept is lower than what the project investors want to offer ∂, which means the dilution is so high that the existing project company shareholders lose, the project company will face a tradeoff between selling undervalued asset and foregoing the gas pipeline project. Here, external equity to finance the gas pipeline project is expensive. Hence, it will not undertake the gas projects.

However, if the project company is in lemon state and on the assumption that dilution is low in this state ($\geq\partial$), the project company accept external financing as its assets is overvalued and external equity is cheap and therefore carry out the project.

The critical issue here is that when the project company issues equity, outside investors usually worry that the management of the company may have unfavourable information. If so, the security can be overpriced.

Suppose the project company would like to finance the gas pipeline project with debt. There is less worry with debt than equity .Debt securities are safer than equity, and their price is less affected if unfavourable news comes out later. However, there may be disagreement about risks if investors believe that the volatility of the project company`s assets is larger than what the company`s managers believe it is. This will make them demand for a higher face value on the debt instrument as well as a higher interest.

The conclusion here is that an issue of equity would be read as “bad news” by investors and that the new stock the project company wants to issue may only be issued at a discount, hence difficulty in financing the gas project. A convertible debt, which can be viewed as a straight bond and warrant can however be designed since it is insensitive to risk.

4.6 RISKS ASSOCIATED WITH PROJECT FINANCING

One of the merits of project financing is that it paves way for allocation of risks to the parties who can best manage them[18]. There are many fundamental risks that must be identified and allocated between the project sponsor and lenders. Risk is of high significance to both the equity investors and lenders as they both depend on the performance of the project in order to realize the benefits of their respective investments. The sponsors will seek to present the project to the financial market in the most favourable way with the objective of securing lender`s approval. While most sponsors of project are risk takers by the nature of their business activities, they still find it appealing sharing some risks with lenders in high stake projects[19]. The project risks are normally mitigated through their allocation in the contract agreement among all the parties involved in the project. The parties use the contract to cover their positions and interests. Some of the familiar risks are discussed below:

Market Risk

Market risk is the risk that the project company may not earn sufficient revenue to service its debt, operating cost and leave adequate returns for investors. It determines the self-liquidability of the entire project. Generally lenders are concerned about the market risk mostly where there is no established market for the project`s product. The two main variables which often influence the market risk are the demand and price of product. Demand risk is the risk that there will be no sufficient demand for the product to earn enough revenue to cover both investment and product costs. Price risk relates to the future prices becoming either too high or too low for the seller or buyer. Demand and Price Risks are discussed later in this chapter.

Completion Risk

[18] V. Smith, *Project Finance Notes,* (CEPMLP, University of Dundee, January 2007).

[19] G.B. Greenwald, *LNG Project Finance: Sharing Risks with Project Lenders* in Liquefied Natural Gas: Developing and Financing International Projects, 237 (1998).

This is the risk that the project will not be completed on time or at all. It also includes the probability of cost overruns and delays in completion resulting in increased interest and lengthening of repayment profile. For any project to generate adequate returns by way of revenue, it must have passed the completion test. One of the objectives of a lender embarking on financing of a project is to see the project completed to specification and operational to generate the required revenue stream to service repayment of interest and principal. Lenders seek to ensure that the completion phase of the project is completed in accordance with specification, time and within the cost budget.

To mitigate against possible delay in the construction phase of the project, it is essential that such project is handled by professionals and contractor who has requisite skills, and managerial expertise. The risk could also be mitigated by the lender requiring the sponsors to provide completion guarantee and the sponsors in turn mitigate the risk by demanding contractor performance bonds from reputable financial institution. Where there are sub-contractors, the principal contractor must bear the risk. Liquidated damages must be paid by the contractors if the completion dates is not met and such amount must be adequate to cover interest payable on the debt for a reasonable period[20].

Political Risk

Political risk involves threats to project due to events arising from the geo-political environment and the location of the project. Political risk is of high significance to gas projects in view of the natural resources exploitation and the cross border nature of the transactions. Political risk includes country risk and regulatory risk and can be in form of increase in taxation and royalty, imposition of land requirement, revocation of licences, nationalization or outright expropriation. They affect all aspect of the project from site selection and construction to completion, operations and marketing. Project sponsors assume this risk as much as possible; however where this is not possible, lenders will assume them. Project sponsor sometimes expose lenders to this risk to reduce the

[20] See Vinter supra note 15, at 98.

possibility of outright expropriation. Russia and Venezuela in recent times are two good example of a country with serious political risk. In Russia the state gas monopoly, Gazprom used environmental issues to take 50% of the Sakhalin-2 project from Shell and its two Japanese partners, Mitsui and Mitsubishi[21].

Environmental Risks

There can also be environmental risk which can be sub grouped under Political risks. By nature, it may not be a risk associated with the entire country of operation but the specific locality in which the company operates. In other words, isolated cases where a particular geographical grouping will make exploration activities of energy companies so difficult. A typical example of this is the Niger Delta region of Nigeria and Cabinda region of Angola where there are agitations and unrest for several years leading to lengthy disruptions to activities of oil companies operation in the region. These disruptions may also come during different phases of the project.

Operating Performance Risk

Operating Performance risk actually starts when the project cannot operate to specification. Lenders usually require full compliance with operating specifications so as to ensure that the estimated project cash flows are not in way negatively affected The projected future cash flow of the project will be influenced by factors like unusually high operating cost, high raw materials, regulatory or environmental risks and market for the product. Lenders try to protect themselves against this risk by ensuring that the project company maintains ratios and loan covenants for maintenance of working capital, payment of dividend.

Technological Risk

Technology can be an operating risk if the technology is difficult to operate. The project may require more technical skills than the operator can provide or the technology. To mitigate technology driven operational risk, lenders must ensure that the project company management have the technical skills to handle the technology in use coupled

[21] http://www.guardian.co.uk/frontpage/story/0,,1970104,00.html

with enough financial backing so that the cost of handling the technology does not have adverse effect on the cash flow of the company in paying back both the principal debt and interest element[22].

Foreign Exchange Risk

Foreign Exchange Risk is the risk of fluctuation in foreign currencies. However, in a project where capital expenditure, operating expenses, revenue and borrowings are in the same currency, foreign exchange risk will not be a problem Foreign exchange risk is mitigated by means of derivatives like forward contracts, futures and swaps[23].

4.7 SPECIFIC RISKS IN GAS PROJECT FINANCING

Force Majeure

Force Majeure means an act of God, more or less a natural and inevitable catastrophe that interrupted the expected course of events. Risk occurs from events not directly resulting from the actions of the parties. Such risk deemed to be out of the parties control can exonerate them from the legal consequences of non-performance. Contracts in project financing should therefore specify events that constitute force majeure which will excuse performance and the legal consequences of each event.

Events commonly included in the force majeure clause are war, strikes, lockouts and other labour disturbances, riots or public disturbances, expropriation, requisition, confiscation or nationalization, blockades or other closure or harbor or docks, severe storms and natural disasters, adverse weather conditions, epidemics and quarantines.. The allocation of force majeure is a much debated issue and the big question has always been who should be responsible and liable for the impact of an unforeseen event that occur independent of the fault of any of the parties. Insurance is commonly used in mitigating the effects of force majeure.

[22] See Donaldson supra note 74, at 8.

[23] See Winfield supra note 42, at 149.

Reservoir Risk

This is the risk that there is insufficient natural resources or the risk that natural resources is not in commercial quantity and satisfactory quality, thus reducing the potential of generating future cash flow needed to service loan. This form of risk is usually mitigated by the lenders` own valuation of the reservoir using a technical team. Lenders also bring their previous experience to bear as they have experts on their payroll.

Volume Risk

Volume risk is the risk that sufficient volume of gas will not be taken by the off taker or buyer to guarantee a minimum level of revenue for the project. It is usually addressed in the gas industry by the use of gas sales contract. Project sponsors usually ensure a minimum level of buyers before going ahead with construction and actual production of gas. The gas sales contract is meant to underpin the demand from buyers and ensure generation of cash streams to pay for the project. This is achieved by the means of "take or pay clause" in the sales agreement.

The take or pay clause means that the off taker or buyer has been obliged to pay for a certain quantity of gas whether he was prepared to receive it or not. This ensures a smooth financial flow to defray the heavy capital cost of gas field development and pipeline construction. Often, however, the buyer could offset their payments against receiving gas at a later date in excess of the minimum they contracted for.

The take or pay clause in the gas contract simply requires the off taker to pay for the gas regardless of his take. It also shows the willingness of the buyer to share risk with the lenders. Lenders will therefore seek to restrict the use of make up and carry forward rights and ensure that the take or pay levels are high as this would guarantee a higher level of revenue available for the project. Lenders will also carry out due diligence to ascertain the credit worthiness of the off taker[24].

[24] M. Brothwood, *The EU Gas Directive and Take or Pay Contracts*, OGLTR 318(1998).

Price Risk

This is the risk that prices may be too low that the seller will not earn enough revenue to cover the repayment of the loan or that the price may be too high and thus become uneconomical for the buyer. Usually, gas purchase agreement spans 20-25 years. The price to be paid for a commodity to be delivered over such a time frame requires careful and detailed consideration of several variables and exogenous factors. Uneconomic prices could either be that future realities make the price very high in comparison to other energy substitutes or too low to meet the capital cost requirement of the seller. To mitigate this risk, contract price for future deliveries of gas is usually indexed to the price of alternative of gas such as oil. Price risk for seller is also mitigated through the use of price ceiling.

The emergence of spot market for gas could potentially undermine the relative price stability that has been a feature of the gas industry. Of concern to the lenders is the need to ensure a price range that will guarantee the ability of the project to meet debt obligations. The other form of price risks could be volatility of the gas price. Lenders want to be repaid in the manner and at time specified. Fluctuation of energy prices tends to create uncertainty which increases perceived risks associated with the project. The potential impact of price volatility or energy price risk on the economies of energy projects cannot therefore be overemphasized

4.8 NEED FOR SECURITY

Lenders usually demand for collateral to reduce their exposure in the advent of failure of the borrower`s business. Project finance lenders normally require security for the following reasons:

i) In case of default on payment, bankruptcy and eventual wind up of the project, lenders want to rank first among creditors as there will be other creditors like suppliers of raw materials.

ii) In case the project turns out to be unsuccessful, lenders will want to sell the entire project to another party.
iii) Where the project assets are fixed and there is no alternative use of the assets, the lenders may want to take over the assets pending when a market is found for them.

Generally, lenders will usually wish to have security over all the assets of the project company as follows:

i) Security interest over all fixed assets and property of the project company.
ii) Charges of contractual rights.

CHAPTER FIVE

5 WEST AFRICAN GAS PIPELINE PROJECT

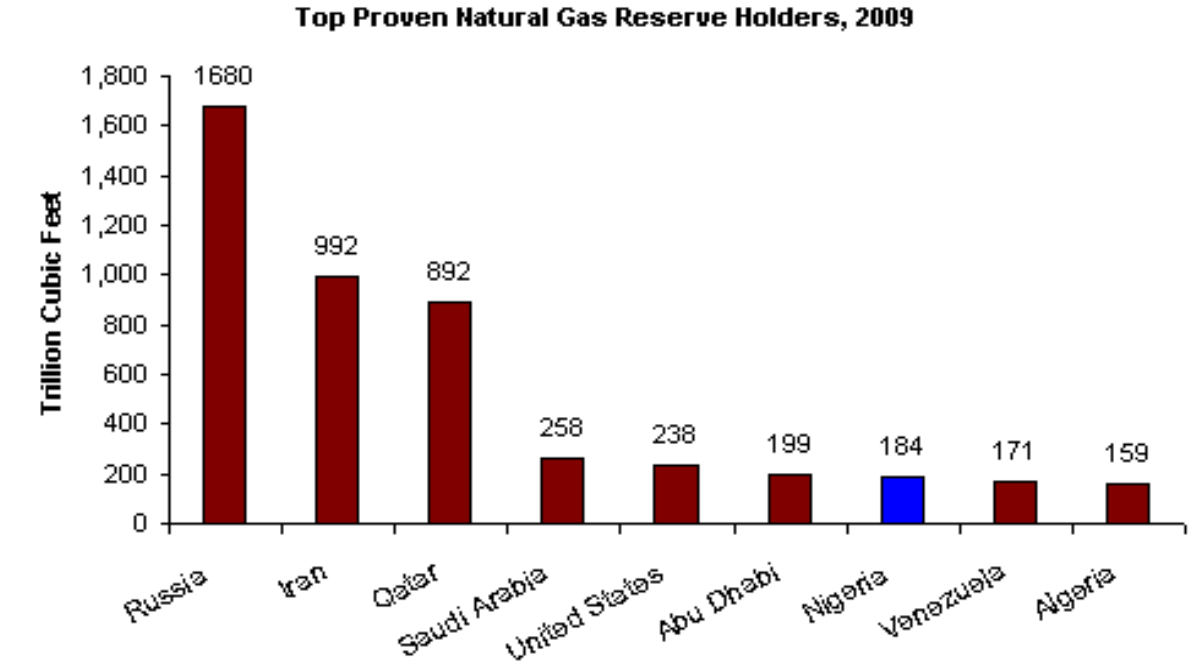
5.1 Background

The West African Gas Pipeline Project is a transnational gas pipeline project in the West African Sub region being facilitated by the government of Benin, Ghana Nigeria and Togo. In 1982, the Economic Community of West African States (ECOWAS) mooted, as part of its key strategic economic policies to develop a natural gas pipeline throughout West Africa. This proposal was further strengthened by the feasibility study conducted on the possibility of supplying gas from Nigeria to Ghana. A feasibility report prepared for the World Bank in the early 1990s deemed that a pipeline to transport Nigerian gas to Benin, Togo and Ghana was commercially viable.

In 1995, the government of the four nations signed a Heads of Government Agreement (HGA) pertaining to the pipeline. The HGA broadly outlined the principle of the pipeline development. In August 1998, a consortium of Chevron, Shell, NNPC, Ghana National Petroleum Corporation (GNPC), SoBeGaz and SoToGaz signed an agreement commissioning a feasibility study on West African Gas Pipeline (WAGP). The study which was completed in March 1999 concluded the commercial and technical viability of WAGP and projected that it could be operational as early as 2002. On August 1999, in Cotonou, Benin, a Memorandum of Understanding was signed by the four countries and the consortium establishing the legal framework for WAGP. The joint venture agreement naming Chevron as the WAGP project manager was signed on August 15, 1999 in Abuja, Nigeria. The four nations however signed an Inter-Governmental Agreement (IGA) in February 2000 and the agreement established the framework for realizing the pipeline venture. The IGA includes the government commitment to the pipeline owners and gas distributors on the conditions for the development, construction and operation of the WAGP as well as fiscal and custom policies for the venture. The project has received administrative support from the ECOWAS Secretariat and technical assistance ($1.55million) from the United State Agency for International Development (USAID).

The treaty which is for a 20-year period provides for a comprehensive legal, fiscal and regulatory framework as well as a single authority for the implementation of the project. The project ownership was structured through a holding company. The West African Gas Pipeline Company (WAGPCO) has its shareholding as follows: Chevron Nigeria Ltd (35.7%), NNPC (25%), SPDC (18%), Ghana`s Volta River Authority 15.3%, SoBeGaz (2%) and SoToGaz (2%). WAGPCO is registered as a limited liability company in Bermuda and will be saddled with the day-to-day running of the pipeline.

By the report of the United States Energy Information Agency (US EIA), Nigeria has the highest proven reserve of gas in the whole of Africa. It has about 184 trillion cubic feet of natural gas reserves making it the seventh largest natural gas reserve holder in the world. West Africa to which Nigeria belong has approximately 32 percent of Africa`s total natural gas reserves. Other countries in this region include Ivory Coast (1.0 Tcf), Ghana (840 Bcf), and Benin (40 Bcf).

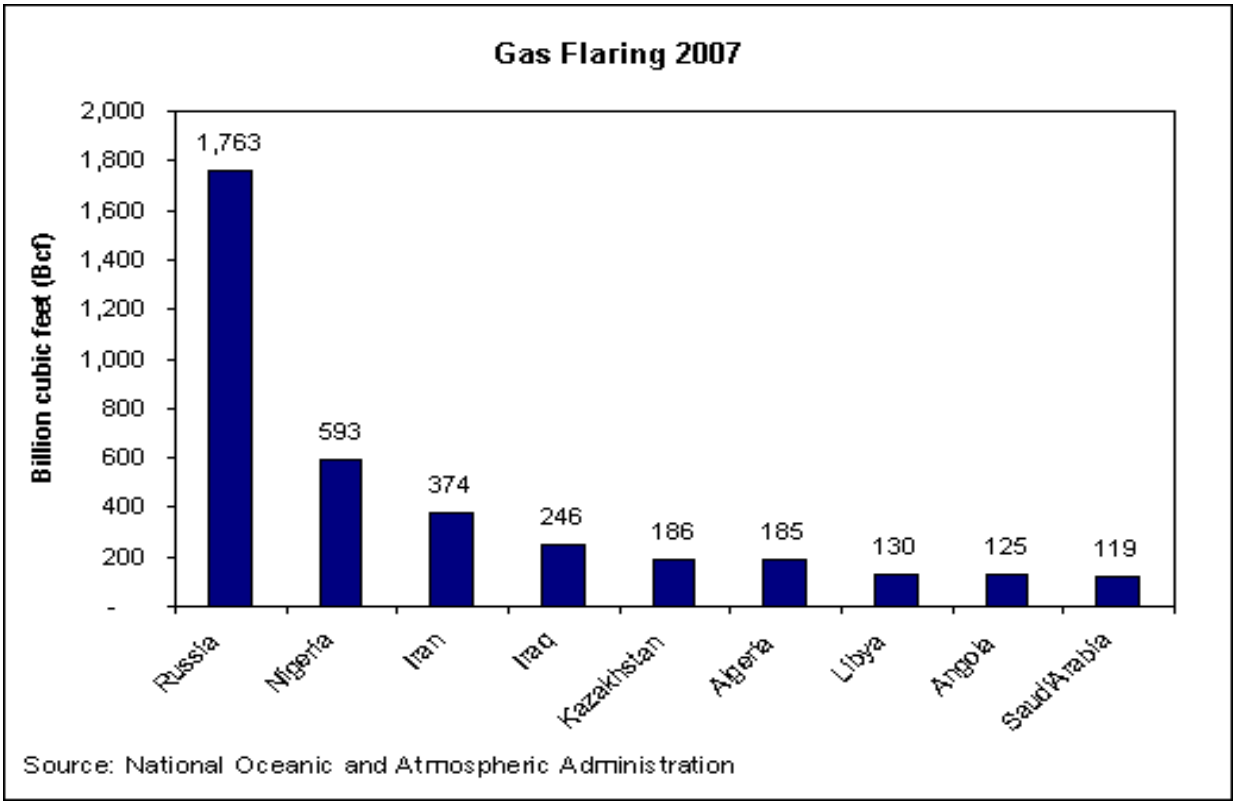


Source: *Oil and Gas Journal 2009*

Nigeria still flares about 40 percent of the natural gas it produces and re-injects about 12 percent to enhance oil recovery. The World Bank reports that Nigeria account for

12.5% of the world`s total gas flaring. This is because many of Nigeria`s oil field lack the infrastructure to produce and market associated natural gas.

According to Shell, about half of the 2 Bcf/d (Billion cubic feet per day) of associated gas (gaseous byproduct of oil extraction) is flared in Nigeria annually. This has thus paved way for new industry strategy geared towards collecting the associated gas and processing it into LNG which has greatly enhanced natural gas revenue while simultaneously reducing carbon emissions.



The abundance of natural gas in Nigeria led to successful LNG project in 1999. Most of the natural gas used in Nigeria today is non-associated gas whereas the associated gases from oil exploration are usually flared. Although natural gas is still in early stage of use in the region, several projects are underway that would increase the future use of the resource. One of such projects is the West African Gas Pipeline Project. Incidentally, this project has faced lots of threats and risks of recent.

The West African Gas Pipeline (WAGP) is the first transnational gas pipeline in the West African sub region. Today, the project is facing several challenges as all the countries involved have never dealt with any other country on pipeline projects before. WAGP is an initiative of Economic Community of West African States and was first proposed in 1982. There are four countries involved in this project namely Benin, Ghana, Nigeria and Togo. The pipeline originates from Nigeria whose associated gas from Escravos field is to be used to supply the gas for the project. Principally, the project is to meet energy demand in Benin, Togo and Ghana. It will supply natural gas to the power plant in Ghana and some industries in the other countries.

The West African Gas Project is projected to expand the gas market in the West African region over the next twenty years and estimated to create about 80, 000 jobs and reduce green house emission by 100 millions tons.

5.2 PURPOSE OF THE PROJECT

The West African Gas Pipeline Project concerns the construction and operation of a regional gas transmission system that will supply gas produced in Nigeria to power stations in Togo, Benin and Ghana. The objective of setting up the project is to reduce the cost of electricity supply in Ghana, Togo and Benin by replacing oil with gas imported from Nigeria. Thus the West African Gas Pipeline is intended to transport natural gas to electricity generating companies and other industrial users in the sub region.

5.3 PROJECT DETAILS

The WAGP will traverse 520 miles (1,033 kilometers) both onshore and offshore from Nigeria`s Niger Delta region to its final planned terminus in Ghana. The first portion of the pipeline which will deliver gas to the greater Lagos area (Alagbado) is already in existence. The Escravos-Lagos Pipeline (ELP) was commissioned in 1989, supplying natural gas to Nigeria`s Egbin power plant and other industrial consumers in Lagos and Ogun state in the South Western part of Nigeria. ELP has a capacity to handle nearly 900 Mmcf/d of natural gas but currently the majority of this capacity is not utilized. The

spare capacity of the ELP will be used to move gas from Escravos in Niger Delta area of Nigeria to the WAGP. A 34-mile (57 kilometer) onshore portion of the WAGP will run from Alagbado to Seme beach in Lagos state, Nigeria. The WAGP will continue offshore with proposed landfall spurs at Cotonou (Benin), Lome (Togo), Tema (Ghana), Takoradi (Ghana) and Effasu (Ghana). The initial capacity of the WAGP will be 200 Mmcf/d with the capacity to expand to 500 Million cubic feet per day as demand grows.

The associated gas currently being flared in Nigeria is to be used in the project with back up from non-associated gas. Open Access will occur such that anyone can supply or transport gas through WAGP after volume has exceeded 200MMscfd after 10 years, whichever occur first. Gas discoveries in Benin and Togo will be granted immediate access to the pipeline.

This will result in less environmental pollution in Nigeria. More importantly is the fact that the industrial users in the four countries are to benefit from the project. The industries in Benin, Togo and Ghana are also to utilize part of the transported gas as well as the new power plants being constructed in Ghana. Ghana has agreed to take up 85% of the total capacity of the gas volume to be transported to its gas plant on a take or pay basis.
There have been several shifts in the above proposal due to protest from various communities in the Niger Delta Area of Nigeria. This has led to delay in the construction work which shifted the project commencement date from 2005 to 2007

5.4 LEGAL FRAMEWORK OF WAGP

Transnational gas pipeline project that cut across two or more countries are usually affected by domestic and international laws. The WAGP is not an exception as it has an offshore element. Transit Offshore Pipelines on high sea and continental shelf are protected by the United Nations Conference on the Law of the Sea. There are a number of legal instruments that deal with transit issues on pipelines

Some of them include the 1921 Barcelona Convention and Statute on Freedom of Transit, 1947 Article V General Agreement on Tariff and Trade, Article 7, Energy

Charter Treaty. It must however be pointed out that the details of these instruments are beyond the scope of this research work

5.5 THEORETICAL MODEL ON THIRD PARTY ACCESS

At this point, I present and apply the Hannesson discussed in chapter two as it relates to the West African Gas Pipeline Project. Here we have West African Gas Pipeline Company (WAGPCO) as the single buyer and one producer (Nigeria) as the single seller (Bilateral monopoly)

Suppose a supplier delivers to a gas company in another country, which in turn sells the gas to many local distribution companies. In all probability, the pipeline company will face a downward sloping demand schedule for gas to be sold to the local distribution companies. If the pipeline company buys the gas from the producer at a Price P that depends on the total quantity sold (Q), the profit of the pipeline company ($\pi_{t)}$ can be expressed as

(1) $\Pi_t = P(Q)Q - C_tQ$

C_t is transport cost per unit of gas transported. Here, I am assuming that transportation cost shall be fixed.

The first order condition of equation (1) representing the maximization of the pipeline company will be

(2) $P+P'Q\ (= MR) = S+C_t$

This means the company will like to sell the quantity where the marginal revenue (MR) is equal to its marginal cost (MC). In this case, the marginal cost is sum of the unit transport cost and the price to be paid to the producer for obtaining the gas. Since the price of the gas is not independent of the quantity the pipeline company decides to buy from the producer, the former will have to bargain with the latter over the price it pays

and the quantity it sells and the producer will consider the possible collection of price and quantity he can get.

With a given unit cost C_p of producing the gas, the profit of the producer (π_p) will be

(3) $\pi_p = (S - C_p)Q$

Each party will obviously want to maximize its own profit but there is no single solution that optimizes each party`s profit simultaneously. Obviously, there are numerous possibilities to this kind of “cake” dividing problems and one of such will be to divide the cake equally.

The sum of the profits will therefore be

(4) $\Pi_{t+} \pi_p = P(Q)Q - SQ - C_tQ + (S - C_p)Q$

This can be further expressed as $P(Q)Q - (C_{t+} C_p)$

The variable S in equation (4) is the price at which the pipeline company buys gas from the producer. The role of S there is to divide the profits between the two parties.

The first order condition of equation (4) will be

(5) $P + P'Q\ (= MR) = C_{t+} C_p$

This is actually similar to the optimal solution obtained in figure 1 in chapter two (the point P_m Q_m) for the pipeline company as a monopolist. The difference is however the price the pipeline company pays to the producer. So, the best solution in this case would be when the producer and the pipeline company get the same profit, i. e

(6) $S = C_p + ½ (P - C_t - C_p)$

This means the producer gets a fair price that covers his unit cost of production and gives him half of the profit per unit.

Proposition- How would Third party Access Affects this solution?

If we look at a simple world of bilateral monopoly, it would mean that the pipeline company would be obliged to allow the producer access to its pipeline at a tariff that would only make the pipeline company earn a normal return on its investment. Thus, the producer would most likely get all the profit because he would limit his sales to whatever maximizes his profit, which in this case will be the monopoly quantity and a sufficient higher price.

Here, I conclude that the implication of third party access in a market for gas with a pipeline company (West African Gas Pipeline Company) as the single buyer and Nigeria as the sole producer will be to concentrate absolute monopoly power in the hands of the producer.

5.6 FINANCING OF WAGP

The West African Gas Pipeline project is being funded by the sponsors through the project company, WAPCO with guarantees provided by the World Bank. It was estimated to cost about $590m to $600m.The World Bank in 2004 approved guarantees totaling $125m to mitigate political risks linked to natural gas sales to state owned power companies.

The European Investment Bank also gave 70m euro representing a significant share of Ghana participation in the project. However information available indicated that the project completion cost is expected to gulp about $1.1billion. The major incentive for the sponsor is the ability of the project to improve the competitiveness of the energy sector in Ghana, Benin and Togo by promoting the use of cheaper and environmentally cleaner gas from Nigeria.

5.7 FUTURE OF WAGP

The West African Gas Project being the first of its kind in West African sub region portends some strategic opportunities for the four participating countries and the sub region as a whole. These can be described as follows:

Reduction in Gas Flaring

WAGP provides an opportunity for Nigeria to export her associated gas which is being flared because there is no domestic market yet in place in the country. Nigeria is currently responsible for about 12.5% of total global gas flaring according to World bank Report. Gas flaring is inimical to both the environment and the people of Niger Delta area of Nigeria. In addition, scientific research has also proven that it can lead to leukemia and premature death.

Export Market

Currently, a significant portion of Nigeria`s natural gas is processed into LNG. Nigeria`s most ambitious natural gas project is the Nigeria Liquefied Natural Gas (NLNG) facility on Bonny Island. Coupled with LNG, Nigeria plans to export some of its gas via West African Gas Pipelines which is expected to be completed before end of 2010. Income from exportation of gas is expected to boost the revenue base of Nigeria.

Promotion of Regional Cooperation

The West African Gas Project is further strengthening mutual interest among the member nations of ECOWAS especially the four participating countries. Nigeria is for instance playing a major role in the stability of political regimes of Togo, Benin Republic etc. Nigerian owned companies are presently foraying into neighbouring States like Ghana, Gambia, Sierra Leone, Cote d'Ivoire, Benin Republic etc. Banks, Insurance firms and Manufacturing entities from Nigeria currently have a good number of branches and subsidiaries in countries like Benin, Ghana, Togo and other member nations of ECOWAS.

Improved Power Generation

There are about 16 member nations that constitute ECOWAS and nearly all the countries do not have capacity to meet power demand. Though Nigeria is currently building some power plants nationwide, the completion of WAGP will provide means to buy cheap gas for use in power plant.

Development of Gas Market in West African Sub region

The completion of WAGP will ensure the development of a gas market in the West African sub region. There are a number of companies in Nigeria whose production capacity is heavily dependent on energy. In addition, firms like West African Cement plant in Togo as well as OTP Phosphate Manufacturing Plant in Ghana are among the many companies which may likely benefit from such gas market. It is expected that such energy intensive industries will rely on WAGP to a great extent for the supply of natural gas for energy use.

Proposed Trans-Saharan Pipeline

Nigeria and Algeria continue to discuss the feasibility of constructing a Trans-Saharan Gas Pipeline (TSGP). The proposed pipeline will originate from WAGP base and then traverse through Niger Republic to Algeria.

Revenue from Transit Fee

As prevalent with most pipelines that traverse between two or more countries, transit fees will be charged on the pipelines passing through Benin and Togo. However, the two countries had mutually agreed not to earn transit fee for a fixed period of time.

5.8 THREATS TO COMPLETION OF WAGP

The West African Gas Project will face a host of challenges ranging from capacity utilization, security of supply, pricing of gas etc. These are discussed as follows

PRICING

The demand for natural Gas, like any other commodity that has perfect substitutes will typically depend on its pricing relative to the alternatives available. Unlike Europe where environmental regulation play a significant factor in gas pricing, environmental friendliness of gas least play any role in this regard as there is no government regulation in reducing carbon emissions in the West African sub-region. This therefore suggests that gas supply from WAGP must be sold on competitive basis in order to attract

different industrial users. However, the position of Nigerian National Petroleum Company on gas pricing has been a source of dispute with WAGP promoters and potential customers.

CAPACITY UTILISATION

Due to the fact that demand for gas by industrial users has been projected to increase over the period, this poses a significant threat to the commercial viability of the project especially with the cost overrunning from $800m to $1.2bn. In addition, the possibility that the industrial users in Ghana can use the excess capacity is also uncertain as this is more likely going to depend on economic growth of the countries.

ABILITY OF BUYERS TO PAY

There still remains a significant doubt as regards whether consumers will be able to pay for the supply of gas. For instance, Ghana who had previously signed up 85 per cent of the total volume of gas on a take or pay basis defaulted in fulfilling her obligation to Ivory Coast for importation of electricity. This therefore suggests that there might be difficulty in mitigating the sellers risk in the event that Ghana defaults in payment as the main off-taker of gas.

SECURITY OF SUPPLY

The commercial viability of the West African Gas Pipeline Project is also under threat due to incessant attack from the militant in Niger Delta Region where the pipeline is expected to take its supply of gas. The militants have in the past blown up several pipelines which affected supply of crude oil in the international market.

CHAPTER SIX

6 CONCLUSION

Risks in any project are inevitable. Financing gas pipeline projects anywhere in the world is a risky venture, whether through equity or project financing. However, the chances of success of any project can be increased when risk is carefully evaluated, prioritized and controlled.

The operation of the West African Gas Pipeline would reveal a situation of bilateral monopoly in the West African Gas Market in the future. As fully exploited using the Hannesson model, the far reaching effect of third party access in a world of monopoly between the West African Gas Pipeline Company and the gas producer, Nigeria in this case would be to concentrate absolute market power in the hands of Nigeria. Therefore, the final buyers will have less to gain.

The West African Gas Pipeline Project like all other transnational gas pipelines has several threats that can mar its successful completion. While the threats pointed out earlier pose a serious challenge to the project sponsors, adequate planning as well as concerted efforts from all the parties involved could mitigate these threats.

It is imperative to argue that the attendant opportunities likely to be created by this project outweigh the threats. Some other threats may come up when the project becomes operational but mitigating such threats will depend on the contingency plan put in place.

Clearly, third party access would not provide much benefit to customers in a world of single supplier but would it happen in the world of continental Europe with three external suppliers, Norway, Russia and Algeria. This question is not fully answered but would probably depend on the strength of third party access across international borders.

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