GAS – THE FUTURE

In the early days of crude oil exploration there was a saying that finding gas is akin to finding a dry hole.

Over time however this perception has changed, with the resultant effect that due to its high efficiency and environmental benefits over crude oil and coal, gas is now widely touted as the fuel of the future.

Early commercial development of gas reserves was stalled for various reasons, chief amongst which was the inflexibility of pipeline delivery systems and the intensive capital outlay required to transport gas by sea.

Most countries that have substantial gas reserves have limited local markets, neither can the indigenous supplies of large users adequately cater for all their future needs.

Gas can either be associated or unassociated; gas is associated when it is found in the same well as crude oil, and unassociated when it is not.

Gas is transported either as CNG (Compressed Natural Gas), LPG (Liquefied Petroleum Gas) by pipeline or as LNG (Liquefied Natural Gas) by cryogenic tanker ships.

Liquefied Petroleum Gas (LPG) is gas that is found together with petroleum and in some cases is in fact a condensate of the heavier hydrocarbons i.e. butane and propane.
In producing this type of gas, care has to be taken because if the high pressure that caused the condensate is not properly maintained/managed, the gas can liquidify and be unrecoverable.

Natural Gas is gas occurring in its natural state as simply gas, it consists mainly of methane and is not a condensate of heavier hydrocarbons, all that need be done for the gas to be produced is that a well be drilled from a low-pressure surface to the high-pressure reservoir.

Liquefied Natural Gas (LNG) is natural gas that has been liquidified from its gaseous state to a liquid state.

It is cooled in huge refrigeration units called trains; liquefaction involves the removal of heat by passing the compressed natural gas over surfaces cooled by another gas in order to reduce the temperature of the natural gas.

After liquefaction the gas occupies $1/600^{th}$ of its gaseous volume and weighs approximately half of an equivalent volume of water.

LNG must be kept very cold for it to remain in liquid form; it must therefore be kept in insulated tanks at all times.

LNG is typically transported by specialized tankers with insulated walls, and is kept in liquid form by auto-refrigeration, a process in which the LNG is kept at its boiling

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point, so that any heat additions are countered by energy lost from the LNG vapour that is vented out of storage and used to power the vessel.

It is shipped in cryogenic tankers to terminals in importing countries where it is regasified in a regasifier (wherein the pressure is reduced so the liquid warms) that converts the liquefied product to pipeline quality gas which is fed into local pipelines for distribution.

Compared to crude oil, gas transportation is very expensive; on the average it costs between 400%-500% more to pipeline gas than crude oil; also it costs 30 times more to transport natural gas in liquid form by sea than it costs to transport crude oil via a tanker.

LNG tankers for instance on the average cost about $200 million and can contain 125,000-135,000 cubic meters of LNG i.e. approximately 60-65 Olympic swimming pools.

Due to the capital outlay involved, gas pipelines are only constructed/developed if the gas reserves are substantial enough to enable a recovery of the costs and take a profit.

Hence each discovery is assessed on a case-by-case basis to determine if a pipeline should be built, or if a seaport were accessible, then an LNG project would be preferable.

In the event that either option has extremely prohibitive costs, a consortium of sellers/buyers could come together to finance an LNG plant/gas pipeline with the sales proceeds, alternatively gas from several fields could be pooled together for development.

Also if neither option is commercially viable then local production of export products such as liquid fuels or fertilizer may become desirable. Gas To Liquids Technology (GTL) could also be utilized, to convert gas to comparatively priced premium fuel, for small and otherwise non-commercially viable gas reserves.

Gas To Liquids Technology is a process for converting natural gas into synthetic oil, which can then be further processed into fuels and other hydrocarbon-based products.

In the simplest of terms, the GTL process tears natural gas molecules apart and reassembles them into longer chain molecules, like those that comprise crude oil.

However with this particular conversion process, the result is an extremely pure, synthetic crude oil that is virtually free of contaminants such as sulphur, aromatics and metals.

This synthetic crude can then be refined into products such as diesel fuel, naphtha, wax and other liquid petroleum or specialty products.

A GTL plant would however cost about 60% more than an LNG plant of similar capacity.

A number of companies have approached the Nigerian National Petroleum Company for GTL licenses.

Sasol has the largest synthetic gas project in the world and is capable of producing over 25,000 barrels per day.

Sasol and Chevron together plan to build a 30,000 barrels per day GTL plant in Nigeria that would cost $1 billion, even with crude oil prices at $17 per barrel the plant is said to be competitive, with crude oil presently selling for about $50 per barrel the appeal of GTL cannot be overemphasized!

The benefits of GTL include a dramatic reduction in wasteful flaring of natural gas associated with crude oil production where there are no local markets, and the exciting prospective to unlock the value potential of stranded gas reserves.

One well-regarded recent study from Business Communications Company Inc. estimates total world production of GTL to exceed $120 billion by 2005, growing 5.5% per year from 1999 to 2004.

In Nigeria over the past half a century, gas has usually been flared, however there is now a National Gas Policy in place which states amongst other things that gas which is not utilized belongs to the Federal Government; government also seeks to outlaw flaring of gas by 2008.

Before the inception of Gaslink Limited and a handful of other gas companies, there was no pipeline network for the distribution of gas to other end-users. The infrastructure required to enable gas be sold by pipeline barely existed, the only exceptions were the National Electric Power Authority thermal stations whose turbines were gas fired.

Subsequently with the Greater Lagos Gas Scheme and Lekki Gas Schemes, gas is delivered via pipeline to industrial end-users.

However, the possibility of delivering gas to domestic end-users via pipeline may not be commercially viable in view of the fact that gas is not used for heating purposes in Nigeria.

On the average a home utilizes 12.5kg of LPG monthly for cooking purposes and this cannot presently justify the intensive capital outlay required for laying the pipelines, but for well-structured estates gas may be delivered via pipelines.

Before the energy crisis of the 1970's, it was not commercially expedient to produce LNG but subsequently the economics favoured its production and Asian countries notably Japan (which accounts for over 60% of imports) began to import LNG for power generation.

A **Liquefied Natural Gas project** usually runs into billions of dollars hence several players are involved at every stage from gas production, transmission, liquefaction and storage to marine transportation, regasification and distribution to the end-users.

At every point it is imperative that there is proper/adequate documentation and protection of the entities involved. Also due to the interconnectedness of the various units the entire project can be thrown into jeopardy if there is a disruption in any one or more phases.

Over time there have evolved three major forms for structuring an LNG export project viz:

1. Project company;
2. Tolling company; and
3. Non-Incorporated Joint Venture.

Project company: - The parties incorporate a company usually in the country where the gas is located, they are shareholders in the company and all participate in its financing and running.

The company buys gas from upstream producers, liquefies and sells the end product; profits are shared by way of dividends.

The Nigeria LNG Project is run on this basis.

The major draw back of this format is that at the time of formation only a stated number of trains are to be owned and operated, there is no mention of expansion plans with the consequent effect that the holdings of foreign investors is reduced in the subsequent/additional trains.

It remains to be seen if the Nigeria LNG will proceed on this footing, however there seems to be an agreement as regards subsequent trains.

By 2009 both the Bonny Island and Brass LNG projects will have a total of 8 trains.

Tolling company: - It has been adopted in Indonesia, essentially the state owned oil company finances and owns the LNG plants and it is operated on a non-profit basis.

The LNG plant is owned by an incorporated entity but it neither buys gas nor sells LNG, rather the state owned oil company and its production-sharing contractors market the LNG to buyers.

Profit is shared between the state owned oil company and the foreign participants at the upstream level according to the equity splits set forth in the relevant production sharing contracts.

Non-incorporated Joint Venture: - The participants each own a part of the LNG plant, supply a part of the gas and are entitled to a part of the revenue, all in equal shares.

However due to the need to maximise legal, tax and marketing opportunities the entity is not incorporated; this approach is very common for upstream oil and gas ventures but rarely used for downstream operations.

It is common in countries where the government takes a passive role i.e. is interested only in royalty or tax and the legal system makes provision for such unincorporated ventures.

Oil/Gas acreage development
There are several alternatives for developing gas/oil acreage, they include the following:

1. Support
2. Farm out
3. Joint operation
4. Farm out (drilling) options
5. Seismic options
6. Exploration agreements

They are normally used in combination; our primary concern here however is on Farm out/Farm in Agreements and Production Agreements.

Joint Operation Agreement
A joint operating agreement has two main functions viz:
Firstly to establish the basis for sharing rights and liabilities among the parties (normally according to their participation), and
Secondly to provide for the manner in which operations will be conducted by a designated operator subject to the supervision of an operating committee comprised of one representative from each party to the joint operating agreement.

Farm out Agreement
A farm out is an agreement by one who owns drilling rights to assign all or a portion of those rights to another in return for drilling and testing on the property.

This could be due to several reasons including budgetary constraints, which make it difficult for the owner of the drilling rights to personally carry out the drilling or perhaps it wants to reduce/eliminate risk and does not mind accepting a reduction in acreage/potential aggregate return.

Other reasons would include maintaining its leases; having the area evaluated and tested; or securing a cost and risk free interest in production.

The individual or entity that owns the lease, called the “farmor” or “farmoutor” is said to “farm out” its rights. The person or entity that receives the rights to drill is referred to as the “farmee” or “farmoutee”

Essentially there is no difference between a farm out and farm in agreement.

Farm in Agreement
A farm in agreement is simply a farm out agreement from the vantage of the transferee, who is receiving an assignment of an interest in the concession in exchange for undertaking certain drilling and development obligations.

The farmee utilizes the option because it is perhaps the only way for it to acquire an interest in an acreage that the farmoutee would otherwise not sell; also there are tax advantages to be gained by being a farmee.

Farm out/Joint Operating Agreement
The primary distinction between an operating agreement and a farm out agreement is functional.

A farm out agreement is a contract by which one party earns an interest in an oil and gas lease owned by another, while an operating agreement is entered into to define the rights and duties of parties who already own joint interests in a lease or a drilling unit and to combine those interests for joint operations.

Another distinction is that the farmee "carries" (i.e. advances the costs of the operation and later reimburses itself out of production) the farmor for all or a portion of the drilling costs in a farm out, while the parties to an operating agreement generally share the costs of drilling.

Typically, those who enter into a farm out agreement also execute an operating agreement to govern their rights after they have performed the farm out contract.

In farm in agreements it is not unusual that the agreement be made subject to approval of the government of the country that issued the license.

A farm out agreement must address the following issues:

1. **Subject matter**: - This refers to the extent of the farmor's maximum commitment.
   The farmee must satisfy certain minimum requirements if it is to earn anything under the farm out but its earning may be increased up to a specified maximum interest if it performs more than the "bare minimum" earning requirements, thus the acreage and maximum drilling depth must therefore be stated.

   Parties must also agree on what will be done with subsequently acquired acreage in the farm out area, the practice is that parties shall have the right to share in any extensions or renewals of the leases committed to the farm out, but this must be expressly stated in the agreement because in the absence of an area of mutual interest (AMI) provision in the agreement, a right to share will not be implied

2. **Earning requirements/obligations**: - This refers to the obligations the farmee must carry out to earn an interest in the acreage.

The farm out agreement must spell out the number of wells to be drilled as "earning wells" by the farmee, the amount of acreage earned by the drilling of each such well, and whether the drilling of one or more of the wells is mandatory (a "required" well) or optional.

If the farm out area is limited to a single drilling and spacing unit, there is but one well to be drilled; whether the drilling of that well is merely a condition of earning (an "optional" well) or is a contractual obligation (a "mandatory" well) is simply a matter for negotiation.

If the farm out area covers multiple possible well locations, it is quite common that the farmee must drill several wells to earn an interest through out the entire farm out area.

Quite commonly, the drilling of the first well will be mandatory and such drilling will earn the farmee an interest in the drilling and spacing unit upon which the well is located and –for an exploratory farm out—in certain offsetting and spacing units.
If the farmee wishes to earn an interest in the balance of the farm out area, it may do so by drilling additional earning wells, with such additional drilling normally being optional with the farmee.

If the farm out area is not too broad, the agreement will normally provide for the drilling of a specified number of additional optional earning wells. For broad farm out areas, a "continuous drilling" provision may be included, under which the farmee may continue to earn additional acreage so long as it commences a new earning well within a specified number of days following the completion or abandonment of the last earning well. Also, if the farmor is committing its leases over a very broad farm out area, there may be more than one mandatory earning well.

A careful study of the farm out agreement may show that some wells labelled as "mandatory" are in fact optional conditions of earning.
Thus, an early article in the contract describing a "mandatory" well may be followed by a subsequent "performance" provision stating that the only penalty for failing to drill the "mandatory" well is a loss of acreage which otherwise would have been assigned.

It is also important for a farmor to realise that most smaller farmees assume that all earning wells are simply conditions of earning, no matter how the farm out agreement is worded. If the farmor wishes to ensure that the farmee considers itself contractually committed to the drilling of the mandatory earning wells, it may wish to insert a "non-drilling payment" provision in the agreement specifying an agreed monetary compensation which shall be paid by the farmee to the farmor if the mandatory earning wells are not drilled.

3. **Interests acquired and reserved: -** This refers to which interests will be assigned to the farmee if these earning requirements are satisfied and what the farmor will reserve.
The structure of the farm out as to interests assigned in production and acreage is influenced by both business and tax considerations. To ensure the fullest deductibility of intangible drilling and development costs, the majority of farm outs are structured so that the farmee bears 100% of the costs of drilling each earning well and is assigned 100% of the "working

interest" (the leasehold operating rights) in the earning-well drilling and spacing unit, with the farmor reserving an overriding royalty during the "payout" period (the period until working interest revenues, net of operating costs, equal the cost of drilling, completing, and equipping the well). Once this payout has occurred, the farmor is given the option to convert its overriding royalty interest to an undivided working interest.

In addition to permitting the farmee to secure maximum deductibility of its intangibles, this "convertible override" approach permits the farmee to receive the lion's share of revenues until payout has limited its cost exposure, but then allows the farmor to share significantly in well revenues.

If as is typical in an exploratory farm out, the farmor has "sweetened" the deal to the farmee by providing that the farmee will also be assigned an interest in certain drilling and spacing units offsetting the earning well, the farmee is normally assigned an undivided working interest in this "boot" acreage with the farmor similarly reserving an undivided working interest in the acreage.

Other secondary issues are provisions for drilling substitute wells in the event of drilling problems; force majuere clause; a stipulation that the farmees will be bound by the joint operating agreement and an arbitration agreement.

With the announcement by the Federal Government that farm out licenses for gas leases will be issued in 2005, the stage is now set for greater and more profitable growth in the sector.

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