ALSF
ACADEMY

Oil & Gas

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CHAPTER 1

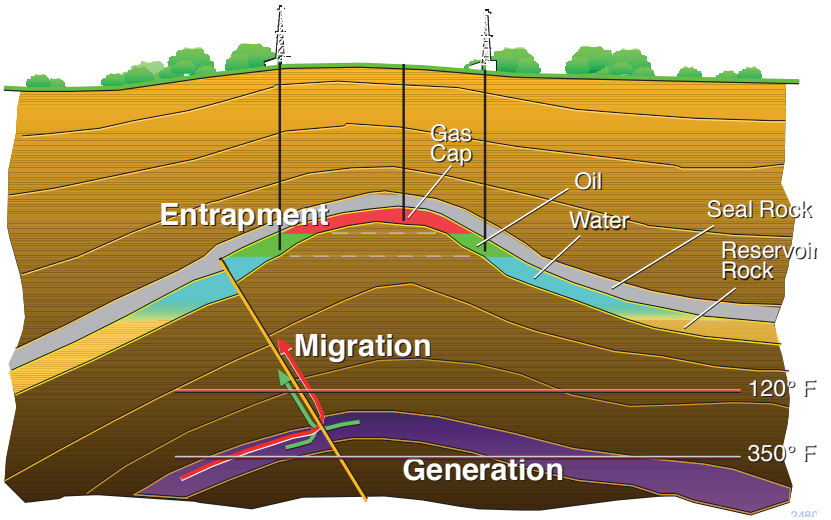
INTRODUCTION AND BACKGROUND TO THE OIL AND GAS INDUSTRY

This chapter provides an explanation of the key features and terminology related to the oil and gas industry. Details of how the oil and gas sector is organised, the politics around the sector, and how the market is priced are also explained. This chapter also introduces an overview of the African oil and gas sector and looks at its potential

1. INTRODUCTION TO OIL AND GAS

1.1. Hydrocarbon System Elements

Petroleum (or «oil and gas» or «hydrocarbons») are formed by the decomposition of marine lifeforms over millions of years. When the sea plants and animals (mostly plankton) died, they sank to the bottom of the sea and accumulated on the seabed, subsequently getting buried under layers of sediment and rock. Over millions of years, this layer of organisms was buried under more and more layers of sediment and rock, deeper below the earth's surface which caused the temperature of the organic material to rise. This heating broke down the organic matter releasing hydrocarbons.



A hydrocarbon system (as depicted by the image above) consists of two to six elements depending on what type of petroleum resource is being sought.

Petroleum is found in reservoirs either under land (onshore) or under the sea (offshore). It is very difficult and expensive to extract petroleum as this requires drilling through rock into a reservoir. A good reservoir acts like a sponge, holding petroleum in a limited area. It also releases that petroleum with less effort, thus making it commercially viable enough for a petroleum company to risk time effort and money in exploiting it.

[1] Source: «Quest for Energy», John Armentrout, 2006

But, even the best reservoir rock will only fill with oil and or gas if there is a pathway connecting the source rock and the reservoir rock (i.e. there needs to be a route between the two rocks, known as a migration route). Petroleum particles move up through the migration route from the source rock in which they were formed. Some petroleum particles migrate all the way to the surface and escape, while other oil and gas particles are prevented from reaching the surface by a trap (a tectonic folding of the strata) and/or seal rock (a rock that overlies the reservoir rock which is resistant to oil and gas penetration).

Oil is generally measured in units of volume, although it can also be measured in units of weight and thermal energy. The standard unit volume for oil measurement is the barrel or «bbl». One barrel is equivalent to 159 litres. Production rates are typically reported in terms of barrels per day.

Similarly, natural gas is measured in terms of its volume at a standardised temperature and pressure. This will typically be reflected in cubic meters. Liquid natural gas (LNG) however is measured by weight.

1.2. Exploration

Exploration is the process of finding oil and gas deposits under the surface of the earth. Exploration is time consuming, capital intensive and highly uncertain even with specialist equipment and personnel. Ideally, a geologist would be able to freely move into and around the earth's subsurface, mapping out the petroleum resource. However, this is physically impossible and, as such, in order to find petroleum, geologists must rely on geophysicists to collect and process indirect images of subsurface earth properties.

Geophysicists use a number of different types of geophysical surveys to identify potential reserves. Gravity and magnetic surveys are general techniques that cover large areas. The most common detailed method are seismic surveys. A seismic survey generates shock waves by setting off explosive charges in small-diameter holes. Geologists then estimate the structure and types of formations under land by measuring travel times of the returned sound waves. «Deformities» in the earth's subsurface may indicate a potential petroleum reservior.

Once a potential petroleum deposit is identified, the appraisal stage begins. Appraisal involves the drilling of holes into the rock to create a well for oil and natural gas production. There are a number oil wells that can be used, each with different functions, with the most common of which during the appraisal stage being:

- **exploration wells** which are used to gather additional data about subsurface structures; and

- **appraisal wells** which are used to assess physical characteristics of oil and gas accumulations (flow rates, specification, etc.)

Depending on the geology and characteristics of the reservoir, a number of wells may be required in order to produce the oil/gas over the life of the resource. Well costs also vary depending on a number of factors such as the type of well, the location, the depth of the resource, whether vertical or horizontal drilling will be used etc.

The type of drilling rig used to drill such wells is dependent on the specific requirements of each drill site and well. Rigs are generally categorized as being either onshore (land) or offshore (marine).

Onshore rigs are generally similar, and many modern rigs are of the cantilevered mast or «jack-knife» derrick type. This type of rig allows the derrick (used to position and support the drill string) to be assembled on the site, and then raised to the vertical position using power from the draw works, or a hoisting system. These structures are made up of prefabricated sections that are moved onto the location by truck or helicopter.

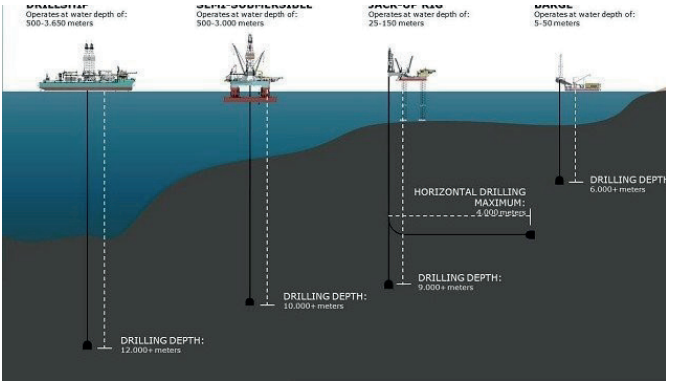
Offshore drilling rigs are divided into two types: fixed and floating structures. Some of the most common offshore rigs are as follows:

- **Jack-up Rig**: a self-elevating rig which is used for smaller, shallower offshore deposits. The rig's floating platform is towed into position by a barge, and is raised above the water's surface by support legs.

- **Semisubmersible Rig**: a floating deck supported by submerged platforms and kept stationary by a series of anchors and lines. This is the most common type of offshore drilling rig, which combines the advantages of submersible rigs with the ability to drill in deep water.

- **Drill Ships**: utilized for extremely deep water drilling in respect of remote locations. Most drillships have greater storage capacity than other types of rigs, which allows for effective operations at these remote locations.

Sea conditions and depth of the resources determines the most appropriate rig. As can be seen in the image below , barges, are generally used in situations where there is very shallow water. Semi-submersible rigs may be used in fairly deep water, where they are floating but anchored by cables into the ground to stop significant movement.



[2] Bejger, Artur & Piasecki, Tomasz. (2013). Technical problems of mud pumps on ultra deepwater drilling rigs. 36. 13-16.

Irrespective of the type of drill rig, the major elements of a drill rig remain the same. There is a tower structure with a steel pulley system for lowering and raising long strings of drilling pipe. There is also a drill bit attached to the end of that pipe that grinds through the rock breaking it into little pieces.

When drilling commences, one of the first operations to take place is the sealing off of the well so that nothing can pass up and through the well and contaminate the surrounding environment. To do this, cement is pushed out of a special cement shoe attached at the bottom of the surface casing. The cement then fills the space between the casing and the borehole wall and seals off any routes that the oil and gas could escape through.

Once the seal is in place, drilling down to the oil and gas reservoir commences. A drill bit is used to drill through the cement shoe at the bottom of the casing and deeper into the subsurface. Water and mud is then circulated down and out through the drill bit and then back up the borehole. The circulation of mud and water serves three main purposes namely:

- it pushes the fragments of rock (known as cuttings) back up to the surface where they can be studied by geologists to ascertain additional information about the subsurface including ascertaining how far the drill bit is from the reservoir. This removal of the cuttings to the surface also assists the drill bit in being able to cut downward into fresh rock;
- it lubricates the drill bit; and
- it acts as a heavy weight barrier preventing hydrocarbons from escaping.

This process is then repeated as the drill bit cuts further into the earth's subsurface - there is drilling, new cement casings and the drilling again. Once the drill bit has reached the final depth (i.e. the level at which the hydrocarbons are contained) the well is completed to allow for the hydrocarbons to flow into the casing in a controlled manner. In brief, completion generally consists of the following processes:

- A perforating gun is lowered into the well. The gun creates holes in the casing through which the hydrocarbons can flow.
- Tubing is run into the holes created by the perforating gun as a conduit for oil and gas to flow up through the well.
- A packer is then run down the outside of the tubing. The packer forms a seal around the outside of the tubing.
- A multi-valved structure called a Christmas tree is then connected to the top of the tubing and cement it to the top of the casing to allow the operators to control the flow of hydrocarbons from the well.

[3] When more detail is needed in relation to the properties of the subsurface, a core bit, often set with industrial diamonds, is used to drill into the formation leaving a solid core of rock in the centre of the drill bit. This sample can then assist the geologists in mapping out the sedimentary structure, bedding patterns, environmental elements and quality of the reservoir.

1.3. Development

The drilling process is expensive and involves significant risk, as the volume and quality of reserves is never entirely known. Statistics show that the likelihood of finding sizeable volumes of oil and gas during the first run is in the region of 20-30%. The cost of finding and developing oil and gas reserves has a significant impact on the long-term success or failure of an upstream oil and gas company. As such, an upstream company needs to take numerous factors into account when considering whether or not the exploitation of a deposit is commercially viable. Some of the factors that an exploration company will consider are:

- volumes and quality of commercially recoverable reserves (based on surveys and appraisals);
- the anticipated market (expected revenue that will be generated through the sale of deposits);
- combined Opex and Capex of production and other infrastructure and the impact of technology (cost of production);
- the regulatory, financial, operating and reporting rules which are applicable to that specific jurisdiction.

1.4. Production

If exploration gets the green light, this will eventually result in production of the respective hydrocarbons. Production is dealt with in the subsequent chapters of this workbook.

1.5. Shale Gas Basics

An introduction to oil and gas would not be complete without a brief introduction to shale gas. In brief, rather than in pockets, shale gas is methane that is trapped in rocks (shale), so it is much harder and more expensive to extract than conventional gas. It is obtained by drilling a vertical well and then drilling horizontally along a shale formation, known as «dimensional drilling». Water and chemicals are blasted at high pressure into the well through the process of «fracking». The water fractures the formation and the chemicals and proppants in the frack fluid hold open the fractures. This increases the permeability of the formation, and oil and gas flows more easily back into the borehole. Continuous flaring is usually required (up to 9 months) to establish the viability of the shale resource.

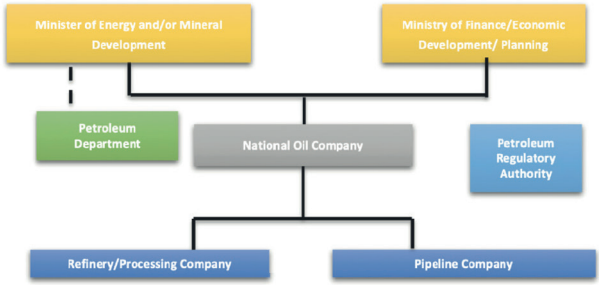
As mentioned above, oil and gas generally coincide underground in a reservoir. As natural gas is less dense than oil, it naturally settles above the oil within the reservoir. When a company drills for oil, this natural gas will usually escape the reservoir and accompany the oil to the surface. In some reservoirs, enough natural gas exists that it is economic to extract it along with the oil. However, in other cases, the gas exists in such small quantities that it is essentially of no use, and as such, flaring is used.

Flaring is the process whereby natural gas is burned off in a controlled manner whilst the oil is being extracted. Flaring is used to minimise the risk of the gas igniting and burning in an uncontrollable manner.

2. SECTOR ORGANISATION

2.1. Typical Domestic Structure

For any country with significant oil and gas resources, the oil and gas sector is usually recognised as being a vital part of a country's economy. In addition, exploration of hydrocarbons is considered high risk given the capital-intensive process and associated potential environmental risks. As such, the oil and gas sector is usually heavily monitored and regulated. A typical regulatory structure for a country with a significant industry is depicted below:



The ministry (usually ministry of energy or minerals) is typically responsible for inter alia, granting and revoking licences, initiating, developing and implementing an oil and gas policy, submitting draft legislation to parliament and negotiating and endorsing petroleum agreements. In some instances, there will be a specific section / department with the ministry responsible for these tasks.

In addition to the ministry, African countries, typically have a separate independent regulatory authority and a government owned National Oil Company (**NOC**). NOCs are prevalent across Africa. NOCs have been established in countries such as Morocco, Nigeria, Ghana, Angola, Kenya, Mozambique and South Africa. The level of authority that the petroleum authority has is dependent on the laws of that specific country.

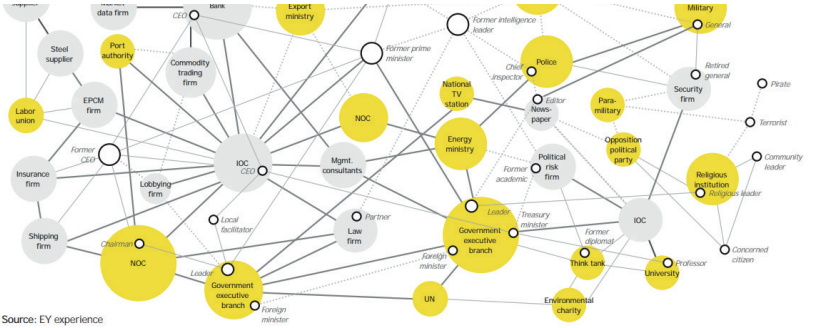
NOCs were first established in the 1960s by newly-independent nations. Algeria's Sonatrach was established in 1963 and is now one the largest NOCs in Africa, and one of the largest oil companies in the world. A recently established NOC is Uganda National Oil Company Limited (UNOC), established in 2013 as a limited liability company wholly owned by the Government of Uganda. UNOC is involved in upstream, midstream and downstream ventures.

The NOC is generally responsible for managing the government's commercial interests in, and business aspects of the petroleum sector. A NOC seeks to, inter alia, maximise value to its shareholders/stakeholders, manage the government's participation in petroleum activities and invest in new upstream, midstream and downstream ventures both locally and internationally.

The NOC itself might have subsidiary or associated private companies, pipeline companies, logistic companies, a refinery/processing company responsible for refining/ processing and petrochemical businesses and a pipeline company responsible for pipeline and storage ventures.

2.2. Geopolitics

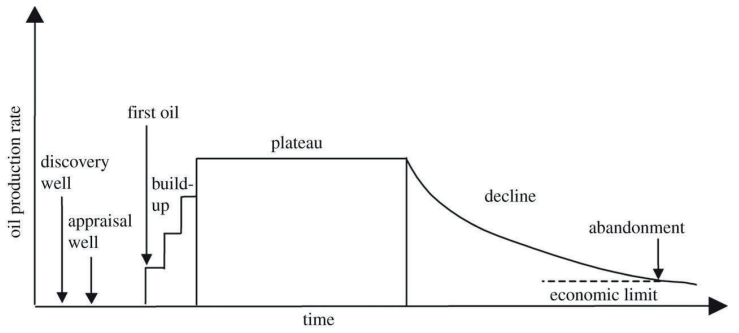
The host state bodies mentioned above represent merely a fraction of the stakeholders involved in the oil and gas sector. Typically, any project will comprise of numerous unpredictable players with competing agendas and differing motives. The below graphic prepared by EY seeks to provide a snapshot of the vast web of interconnections between political actors. institutions, business and individual people that define the global oil and gas industry:



3. MARKET AND PRICING

3.1. Production Profile of an Oilfield

The figure below represents the theoretical production profile of an oilfield, describing various stages of development in an idealised case



[4] EY. (2014) «Navigating geopolitics in oil and gas:Business solutions for a complex world». 4-5
[5] Höök, Mikael & Söderbergh, Bengt & Jakobsson, Kristofer & Aleklett, Kjell. (2009). «The Evolution of Giant Oil Field Production Behavior. Natural Resources Research». 18. 39-56.

Typically, the oil production rate on an oilfield begins with the drilling of the discovery well, followed by an appraisal well. Thereafter additional costs will be incurred with the need to replace the wells and to develop the wells. Once the first oil is extracted, the production rate ramps up as additional wells are developed at the same time. The rate will then eventually plateau as fewer wells are added. Then as time progresses there will be a reduction in the underground pressure, and the oilfield will reach the onset of decline and begin to experience decreasing production.

In order to re-invigorate the oilfield, there are certain secondary or tertiary production techniques that companies make use of. The purpose of secondary production techniques is to maintain reservoir pressure and to displace hydrocarbons toward the surface. The most common secondary production technique is known as «waterflooding», where water is injected into the production zone of the oilfield to push oil from the reservoir effectively reinvigorating the pressure. Additionally, the oilfield may be flooded with carbon dioxide.

Even with the reinvigoration, the wells will get to the stage when production levels hit the economic limits, where the actual operating costs of the oilfield become higher than the revenues generated from the field, at which time it is most likely that the field will go into abandonment.

When an oilfield can no longer produce a sufficient quantity of commercially recoverable reserves, it may be abandoned. On reaching the stage of abandonment, the owner/licensee will generally be required to prepare an abandonment programme for regulatory approval and pay the cost of decommissioning. Decommissioning involves the safe plugging of the hole in the earth's surface and disposal of the equipment used in offshore oil production. Decommissioning is a rapidly developing market sector in the petroleum business, with major potential, but also with major risks. It is a source of major liability for countries, operators, contractors and the public and it must be understood if it is to be managed cost effectively.

The purpose of abandonment is to isolate the hydrocarbon bearing formation in order to protect the underground resources, prevent potential contamination of water sources and prevention of surface leakage. This is ultimately with the aim of restoring the natural integrity of the earth. If a well is not properly abandoned, it may provide pathways for hydrocarbons or other fluids to migrate up the well to the surface. Obviously, environmental considerations are paramount in the decommissioning of an oilfield.

3.2. Oil and Gas Prices

Hydrocarbons are bought and sold at many different prices all over the world though they tend to be «benchmarked» off of certain common standards i.e.:

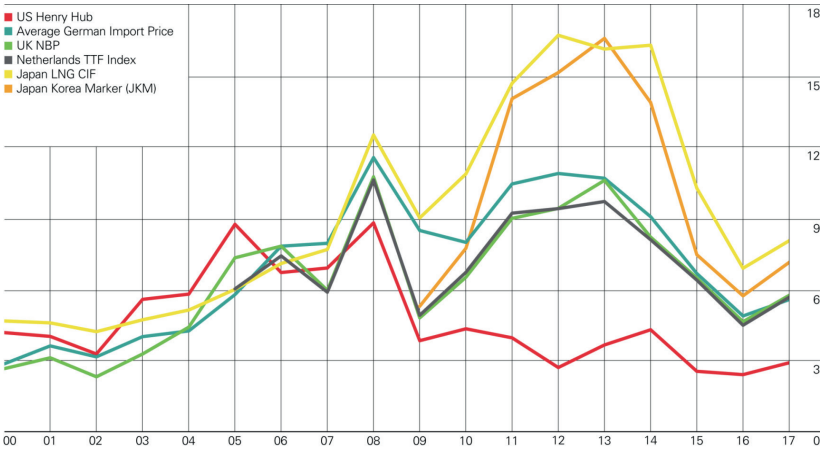
- Brent crude for oil, a trading classification of crude oil that acts as the benchmark price oil worldwide; or

- Henry Hub for gas. Henry Hub is an American benchmark which is also used in Asia, as well as in parts of the global liquefied natural gas market.

Ultimately, the price of crude oil (unrefined petroleum) and other hydrocarbons is determined by global supply and demand. The demand for crude oil depends on the demand for the different products that are produced using the oil. As a product, crude oil is not particularly usable and first needs to be refined into useful petrochemical products, such as gasoline, diesel, jet fuel and ethanol. The different types of crude products will give rise to a different product slate. Light crudes provide higher value products than heavy crudes with the same degree of refining. The effective product price is determined through the cost of refinement and the demand for the type of product that is produced. In reality, the price of oil is actually set in the oil futures market which is based on the market sentiment of the above factors.

As such, the price of oil is generally consistent across the globe. However, the price of gas is slightly different. Historically, the price of gas was directly linked to the oil price which resulted in consistency across the globe, but, if you look at the figure below you will notice varying degrees of pricing - $8 in Japan to $3 in terms of Henry Hub.

Gas prices $/mmBtu



The discrepancies are due to the fact that gas prices are also generally dependent on other external factors and the demand/prevalence of competitors in the sub-markets within which it is sold. By way of example, you will note that all of the European countries have similar pricing. This is because Europe has an established gas pipeline network. As such there's gas on gas competition which ensures that the pricing is generally consistent. In Japan however, gas is effectively replacing oil. The high demand for gas results in a higher price. On the other end of the spectrum, given that the US currently has substantial levels of gas production, such saturation results in lower gas prices.

3.3. Reserve Reporting

Resources are those volumes of oil and gas that are estimated to be present in a particular area of the earth's subsurface. Resources may, or may not, be economically recoverable.

[6] June 2018 BP Statistical Review of World Energy

Reserves on the other hand are those resources that are anticipated to be commercially recovered.

Reserves and resources have a pervasive impact on an oil and gas entity's financial statements impacting on a number of significant areas. These include, but are not limited to:

- depletion, depreciation and amortisation. These are accounting terms for non-cash expenses. Depletion is used to quantify the cost of extracting oil (i.e. depleting an area of oil), depreciation is used to quantify the cost of an asset over its lifespan, and amortisations are used to quantify the cost of intangible assets over their lifespan;

- impairment and reversal of impairment, is where an asset no longer generates any benefit and thus decreases in value earlier than it could have been reasonably expected. If, consequently, the asset increases in value, then it is said that there has been a «reversal» of impairment;

- the recognition of future decommissioning and restoration obligations; and

- allocation of purchase price in business combinations.

As such, public oil and gas companies such as NOCs will generally report their reserves. Reserve reporting measures an oil and gas company's reportable reserves in terms of proved, probable, and possible of their current assets. The longevity and earnings sustainability of those existing assets are important factors to understand the overall financial position of the company including the strength of the company in relation to future earnings.

Proven reserves can be defined as resources that are likely to be economically recoverable. Therefore, for proven reserves, commercial extraction needs to be 90% certain. In contrast, probable reserves are resources which are unlikely to be economically recoverable. Probable reserves have a 50% probability of commercial extraction. Possible reserves are those which have an even lower probability (10%) of commercial extraction.

There are various rules applicable to reporting, which are dependent on where a public company is listed, technical rules as to how much estimated oil is in place that the company can declare, and on the nature of the company's rights in the relevant field. However, reserve reporting must always follow strict guidelines and can be very subjective. Both the United States Securities Exchange Commission (SEC) and the Financial Accounting Standards Board provide rules and definitions that companies must adhere to in quantifying their oil and gas reserves. Many large exploration and production companies have comprehensive SEC-compliant internal policies and committees that oversee the purpose and reporting of proved reserves. A team of geologists, reservoir engineers, and senior management along with third-party petroleum engineering consulting firms annually review the business assets to follow the SEC guidelines.

[7] EY. (2017) « Financial reporting in the oil and gas industry: International Financial Reporting Standards». 13-14

Entities record reserves at the historical cost of finding and developing reserves or acquiring them from third parties. The cost of finding and developing reserves is not directly related to the quantity of reserves. The purchase price allocated to reserves acquired in a business combination is the fair value of the reserves and resources at the date of the business combination, but only at that point in time, i.e. companies have obligations to dismantle, remove and restore items of property, plant and equipment at the end of their offshore and onshore operations and to remediate any environmental damage they may have caused to agreed standards. These obligations are referred to as decommissioning liabilities.

Decommissioning of oil and gas installations is required under a number of international treaties, including the 1958 Geneva Convention on the Continental Shelf, the 1982 United Nations Convention on Law of Sea (UNCLOS) and the 1989 International Maritime Organization (IMO) Guidelines and Standards.

The magnitude of decommissioning costs in the oil and gas industry are substantially large, running into billions of dollars. The actual liability obligations for decommissioning are approximately equal to half of the total debt of the oil and gas industry.

4. OIL AND GAS IN AFRICA

4.1. Brief Overview of the History

While the oil fields in north Africa began to be exploited from 1918 onwards, oil production on the continent did not see rapid expansion until after the Second World War as Middle Eastern oil was deemed more accessible and received greater investment as a result.

VThe continent then saw production increase by a factor of 20 between 1960 and 1970 with instability in the Middle East (in particular, during the 1970s energy crisis) emphasising Africa's growing importance in the global oil market. Much of this growth is attributable to the influence of western companies, which were keen to exploit what they saw as an untapped resource in what has been termed the «New Scramble» for African resources.

In the 1980s, as a result of the decreasing demand for oil there was a significant surplus in production, and prices declined significantly. This limited new investment into African oil-producing nations, and oil production saw little-to-no increase, while OPEC restrictions on production further slowed progress through the period.

As oil prices began to recover at the end of the decade, African producers saw renewed investment, following continued instability in the Middle East (in particular, the first Gulf war). The 2000s saw a sustained hike in oil prices, as tensions in the Middle East sustained economic growth, and a fall in the price of the US Dollar led to the price of oil rising from USD 30 per barrel to almost USD 150 per barrel in the July of 2008. This resulted in significant further investment into Africa with a variety of both onshore and offshore exploratory ventures being carried out.

[8] Untapped: the Scramble for Africa's Oil» by John Gazvanian and Africa: Crude Continent – The Struggle for Africa's Oil Prize by Duncan Clarke.

However, the collapse in financial markets after the global recession in 2008 limited the expansion of the African oil industry. A period of price fluctuation and instability in oil prices followed, with investment and exploratory ventures in Africa faltering. This decline in investment was exasperated following the 2015 collapse in the price of oil.

As the oil price is undergoing a slow recovery, exploiting new discoveries in Africa is one of the key ways in which the oil and gas industry hopes to defer reaching «Peak Oil» in the coming years.

4.2. Future Developments

In recent years, the production of gas has increased more rapidly in Africa than anywhere else in the world, with the exception of the Middle East. There has also been an increase in the investment into the African continent, from NOCs from outside Africa, including China, Malaysia and Russia, which has created a link between broader infrastructure investments and government-to-government relationships in respect of the access to resources. However, the emergence of a new era of structurally lower oil prices is challenging business models that have long relied largely on exploration and production of hydrocarbons, especially 'black gold' (oil).

As such, the future of oil and gas in the African continent will be focused around new and diversified energy sources, maximising regional trade, investing in technology developments, constraining geopolitical forces and protecting their financial resources.

In order for Africa to take advantage of the full potential of the oil and gas industry within the continent, each state will need to analyse and evaluate the political, economic, legal, social and technological factors when assessing the development of its own oil and gas sector.

Key Points:

- Hydrocarbons are formed below the earth's surface over millions of years and, as a result, the process of drilling for hydrocarbons is complex, expensive and involves significant risk.

- The oil and gas sector is a vital part of any country's economy, and is usually heavily regulated.

- Oil and gas projects comprise numerous unpredictable players with competing agendas and differing motives.

- Hydrocarbons are bought and sold at many different prices all over the world but they tend to be «benchmarked» against certain common standards.

- In Africa, the future of oil and gas will be focused around new and diversified energy sources, maximising regional trade, investing in technology developments, constraining geopolitical forces and protecting financial resources.

[9] McKinsey, (2010), Africa's path to growth: Sector by sector, available at https://www.mckinsey.com/featured-insights/middle-east-and-africa/africas-path-to-growth-sector-by-sector, accessed on 17 November 2018.

CHAPTER 2

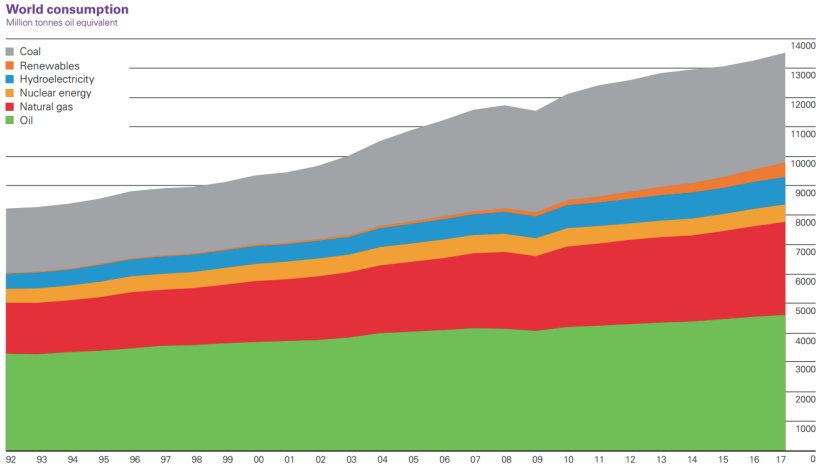
OIL AND GAS PROCESS AND KEY CONCEPTS

This chapter looks at how oil and gas is consumed worldwide and what drives this consumption. It details the composition of oil and gas as well as the key players in the industry. It explains the rising popularity of gas and the commercial viability of both oil and gas.

1. OIL VS GAS - TECHNICAL EXPLANATION

There has been a shift in the last few decades in the dominant fuel consumed worldwide, with another shift expected in the next few years. To understand the importance of oil and gas in the global energy mix, it is important to understand the current status of world energy consumption as well as the technological developments driving supply and demand in the world energy supply chain.

The graph[10] below shows the world total primary energy consumption by fuel types from 1992-2017. World primary energy consumption grew by 2.2% in 2017, up from 1.2% in 2016 and being the highest growth since 2013. All fuels except coal and hydroelectricity grew at above-average rates. Natural gas provided the largest increment to energy consumption at 83 million tonnes of oil equivalent (mtoe), followed by renewable power (69 mtoe) and oil (65 mtoe).

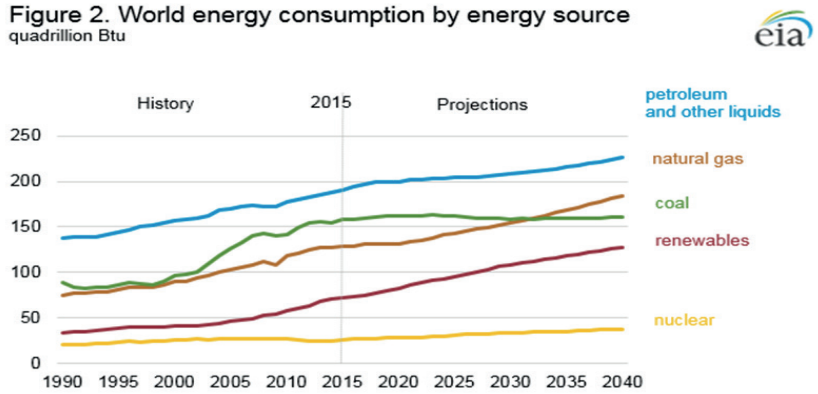


World primary energy consumption grew by 2.2% in 2017, up from 1.2% in 2016 and the highest since 2013. Growth was below average in Asia Pacific, the Middle East and S. & Cent. America but above average in other regions. All fuels except coal and hydroelectricity grew at above-average rates. Natural gas provided the largest increment to energy consumption at 83 million tonnes of oil equivalent (mtoe), followed by renewable power (69 mtoe) and oil (65 mtoe).

The key factors driving the shift in dominant fuels consumed worldwide are **accessibility, affordability** and **sustainability**. For example, the growth in renewable power is mainly driven by countries proposing to reduce their CO2 emissions, whereby a number of countries have signed up to the Paris agreement which pledges to reduce CO2 emissions to control climate change and temperature increases.

[10] Credit :June 2018 BP Statistical Review of World Energy.

The chart below published by the US Energy Information Administration shows world energy consumption forecast out to 2040.



As can be seen, oil consumption is expected to steadily increase to 2040, even with the expected energy transition in Europe and North America and the rise of electrical vehicles. While the greatest increase in worldwide electricity generation is expected to come from renewables, combined cycle generation using gas is currently the cleanest available source of power using hydrocarbons, and gas generation is still expected to steadily increase, helping to balance renewable sources.

1.1. Oil composition and uses

There are generally two sources of oil:

- Conventional oil: this is found in oil wells in the form of vertical shafts which flow into pools of oil and gas that are under pressure, making them relatively easy to bring to the surface.

- Unconventional oil: this type of oil does not flow near the surface and sometimes does not flow at all when it is formed in a solid or near solid state. Unconventional oil sources remain relatively unutilized compared to conventional oil sources. This is largely due to technical constraints and the higher costs associated with their production. Types of unconventional oil include oil sands, oil shale, shale oil, tight oil and heavy and extra-heavy oil.

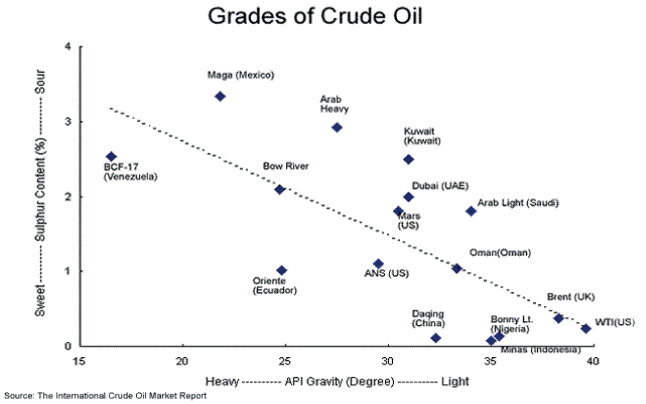
The typical composition of oil is as follows:

Constituent	Percentage
Hydrocarbons	90 – 98%
Nitrogen & Oxygen	0.2 – 3.5%
Sulphur	0.5 – 6%

There are a number of uses for oil which is based on the varying grades of crude oil (see section 1.3 below), such as clothing, parachutes, motorcycle helmets, safety class, toilet seats, fishing rods, shampoo, balloons, hearing aids, antiseptics, and carpets.

1.2. Grades of Crude Oil

Crude oil is typically categorized based on two characteristics: (i) density; and (ii) sulphur content. Density ranges from light (low density, higher API Gravity) to heavy (high density, lower API Gravity), while sulphur content ranges from sweet (low sulphur) to sour (high sulphur). Examples of the different grades of crude oil are illustrated in the graph[11] below.



Source: The International Crude Oil Market Report

Light and sweet crude oil are generally priced higher than heavy and sour crude oils in the market, for the following reasons:

- The less refining a crude oil requires, the more valuable it is considered as certain products derived from certain types of crude oil sell at a higher premium (e.g. gasoline and diesel fuel) than other products. As light, sweet crude oil requires little refining, it is easier and cheaper to produce higher value products from such oil and so there is higher demand for it, which consequently drives up its price.

- Light, sweet grades can be refined with far less sophisticated and energy-intensive refineries. A high sulphur content makes it more difficult to refine and provides poorer end-quality products without more intensive treatment.

1.3. Key Players in the Oil Industry

The table[12] below shows the current top 10 oil producing countries. Out of the top 10 oil producing countries 4 of the countries are located in the Middle East.

[11] Source: The International Crude Oil Market Report
[12] Credit: https://financesonline.com/top-10-oil-producing-countries-in-the-world-wheres-the-greatest-petroleum-dominion

1		Saudi Arabia – **11.75 million barrels per day**
2		United States – **10.59 million barrels per day**
3		Russia – **10.3 million barrels per day**
4		China – **4.19 million barrels per day**
5		Iran – **4.13 million barrels per day**
6		Canada – **3.92 million barrels per day**
7		United Arab Emirates – **3.23 million barrels per day**
8		Mexico – **2.95 million barrels per day**
9		Brazil – **2.8 million barrels per day**
10		Kuwait – **2.75 million barrels per day**

According to current estimates, 81.89% of the world's proven oil reserves are located within OPEC (Organization of the Petroleum Exporting Countries) member countries[13] . The ostensible purpose of OPEC is to manage the supply of oil in order to set the price of oil on the world market so that there is little fluctuation for economies of both producing and purchasing countries. There are currently 16[14] oil-exporting developing nations, with the most recent addition being the Republic of the Congo on 22 June 2018. OPEC members in Africa include Libya (1962), Algeria (1969), Nigeria (1971), Gabon (1975), Angola (2007) and Equatorial Guinea (2017). The bulk of OPEC oil reserves are in the Middle East, which amounts to 65.36% of the OPEC total.

[13] OPEC Annual Statistical Bulletin 2018
[14] In December 2018, Qatar became the first country in the Middle East to leave OPEC.

OPEC Member Countries have made significant additions to their oil reserves in recent years by adopting best practices in the industry, realizing intensive explorations and through enhanced recoveries. As a result, OPEC's proven oil reserves currently stand at 1,214.21 billion barrels. A number of African countries are members of OPEC and the recent addition of the Republic of Congo helps to strengthen Africa's position in the oil industry.

Outside of OPEC the countries with the largest proven reserves are Canada, Russia and the United States.

1.4. Gas composition and uses

One of the key distinctions between gas and oil is that gas contains a lot of relative impurities in its composition. Accordingly, gas needs to be processed in order to remove some of its impurities before it can be used.

The typical composition of gas can be found in the table below. The composition itself can vary depending on the source and form of gas e.g. some types of gas have a higher proportion of propane and butane.

Constituent	Percentage
Methane	94%
Ethane	4%
Propane	0.5%
Butane	0.15%
Pentane	0.07%

There are four main examples of sources and forms of gas:

- **Associated gas**: this is natural gas found in association with oil within a reservoir. This gas can be burnt off in gas flares or processed to be used for products.

- Non-associated gas: this type of gas comes from reservoirs containing only natural gas and no oil.

- **Rich gas**: this is a type of natural gas which contains heavier hydrocarbons than a lean gas i.e. higher concentrations of propane and butane.

- **Natural gas liquids**: these are components of natural gas that are separated from the gas state in the form of liquids. Its liquid content adds important economic value to developments containing this type of fluid. The separation occurs in a field facility or in a gas processing plant through absorption or condensation. Natural gas liquids are further classified based on their vapour pressure:

[15] OPEC website available at https://www.opec.org/opec_web/en/data_graphs/330.htm accessed on 16 November 2018.

- Low = condensate
- Intermediate = natural gas
- High = liquefied petroleum gas i.e. propane or butane

Given the varying compositions of gas and the requirement to process gas to remove impurities, there are a number of different uses including heat, power generation, transportation, fertilizers, plastics, adhesives, solvents, chemicals and fabrics such as polyester and nylon.

1.5. The commerciality of oil and gas

Oil has historically been regarded as commercially more attractive than gas. This is mainly due to oil being more easily transported with lower associated storage costs.

In contrast, gas has typically been more restricted to internal markets due to the difficulty and cost in transporting and storing gas. Similarly, gas is much more likely to be traded via long-term contracts. This means gas is more likely to be obtained from a fixed source and transported to a fixed nearby destination, allowing for less gas to flow to markets with high demand. As a result, currently only 30% of the gas consumed in the world crosses a border; the equivalent for oil is over 70%.

The table below shows some of the commerciality comparisons between oil and gas.

Oil	Gas
worldwide market (ocean freight by tanker)	largely internal or regional markets (pipeline/LNG exceptions)
lower cost storage (concrete bunkers/steel tanks)	higher cost of storage (salt caverns, depleted fields, LNG)
more easily transported (pipelines, road, rail, sea tankers)	Higher cost/more restricted transportation (pipelines/LNG)
liquid market enhances free trade	gas pipelines 12 x cost of oil pipelines for same energy content
financing relatively easy	financing more difficult without long term "take or pay" contracts
interruptions to flow less of a problem (due to greater availability of supply)	interruptions to flow tend to be a major problem – given difficulties/costs of alternative supply
higher value in a compact package	lower value product with greater physical and regulatory constraints

1.6. The Rise of Gas

Despite the advantages referred to above, recently the global markets have experienced a move towards gas as opposed to the historically favoured oil. This shift is largely due to a combination of the diversity in energy mix, market demand, technological and transport developments (particularly in relation to LNG) and environmental considerations arising from climate change concerns.

BP (the British multinational oil and gas company) speculates that gas is set to overtake oil as the world's primary energy source by 2040 as demand for the least polluting fossil fuel grows. Further BP expects overall gas demand to grow by approximately 1.6 % per year, compared with 0.8 % for oil[16].

Conventional onshore and offshore gas production are forecasted to decline from about 2030, while unconventional onshore gas is expected to rise to a peak in 2040. The international accredited registrar and classification society,

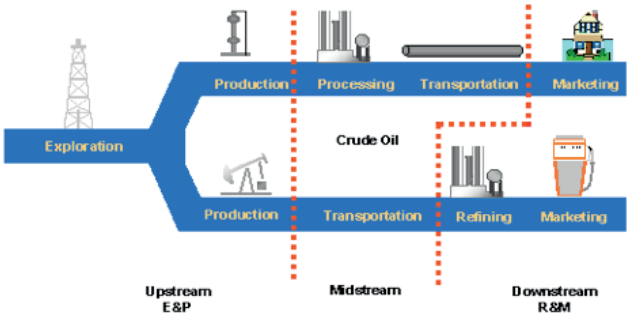
DNV GL (the Norwegian registrar and classification society) expects this trend to lead to leaner, more agile gas developments with shorter lifespans[17] .

An increase in trade from Sub-Saharan Africa to the Indian Subcontinent and South East Asia is also expected. DNV GL forecasts a further transition for the sector in the lead-up to 2050, as greener gases including biogas, syngas and hydrogen enter transmission and distribution systems[18] .

Finally, due to technological advancements the way gas is being transported has also changed drastically and will continue to evolve, allowing gas to be transported to wider global markets. For example, the LNG trade is expanding rapidly (roughly 8% year-on-year) which connects disparate markets (particularly across Asia)[19] , and importing LNG has become simpler and cheaper due to LNG being more efficiently easily stored than in gaseous form. The largest importers of LNG are Japan, China, South Korea and India, whereas the largest exporters of LNG are Qatar, Australia, Malaysia and Nigeria[20].

2. OVERVIEW OF OIL AND GAS INDUSTRY SECTORS

Value chain in gas (top) and oil (bottom) [21]



Any project for the sale of oil or gas must consider the sale and transport of oil or gas within the wider context of overall commercialisation to ensure there are appropriate back-to-back rights, obligations, liabilities and revenue receipts

This essentially requires understanding the links between the 3 sectors of the oil and gas industry.

The first sector is known as «upstream», which is where oil and gas deposits are identified in order to drill wells and recover raw materials from underground. This sector also includes field development and production and is sometimes called the E&P sector (for exploration and production).

The second sector is known as «midstream», whereby it links the upstream and downstream entities. The raw materials that have been extracted in the upstream sector will require refining and processing before it can be transported or stored. Generally, gas will require processing to remove any impurities prior to transportation, whereas oil can be transported or stored straight away.

The third sector is known as «downstream». Downstream operations include refining and marketing, which are focused on creating the end, usable products.

Key points

- Oil consumption is expected to steadily increase through to 2040, even with the expected energy transition.

- Combined cycle generation using gas is currently the cleanest available source of power using hydrocarbons, and gas generation is expected to steadily increase.

- Accessibility, affordability and sustainability are the key factors influencing the shift in consumption of fuels.

- Historically, oil was regarded as commercially more attractive than gas as it is more easily transported with lower associated storage costs.

- The move towards gas is due to a combination of the diversity in energy mix, market demand, technological and transport developments and environmental considerations.

[16] Credit :June 2018 BP Statistical Review of World Energy.
[17] Slater, Neil (2018) 'DNV GL forecasts faster, more agile oil and gas production techniques as industry adapts to the energy transition'
[18] Slater, Neil (2018) 'DNV GL forecasts faster, more agile oil and gas production techniques as industry adapts to the energy transition'
[19] International Gas Union (2018) 2018 World LNG Report, 27th World Gas Conference Edition
[20] International Gas Union (2018) 2018 World LNG Report, 27th World Gas Conference Edition
[21] Quora (2014), What facts should an engineer know when he's entering the oil and gas sector, available at https://www.quora.com/What-facts-should-an-engineer-know-when-hes-entering-the-oil-and-gas-sector accessed on 18 November 2018.

CHAPTER 3

LEGAL FRAMEWORK

This chapter outlines the legislation and licencing frameworks that apply to natural and mineral resources and also looks at how mining rights can be obtained. The various types of oil and gas contracts are detailed here, as well as the international, regional and local regulations that govern the sector.

1. RESOURCE OWNERSHIP AND LICENSING

1.1. Who owns the Hydrocarbon Resources

In most jurisdictions, the government owns the mineral resources that exist within its territory as well as the right to exploit such mineral resources. Consequently, in the vast majority of jurisdictions, obtaining a licence in order to extract oil or gas will require the relevant government's consent.

The two key exceptions to the general rule are the United States of America and Canada, where land ownership carries the right of mineral resource ownership and exploitation. In these jurisdictions it will therefore be necessary to negotiate with the relevant private landowner (except in the case of government-owned land) to obtain exploration and production rights. However this does not mean that one would negotiate wholly with the land owner. State and federal laws, particularly regulations regarding hydraulic fracturing, horizontal drilling and environmental standards, may still impact oil and gas production. By way of example, in the USA, at the federal level, the key regulators in the oil and gas sector are:

- Environmental Protection Agency
- Federal Energy Regulatory Commission
- Department of Energy and Office of Fossil Energy
- Bureau of Land Management
- Bureau of Indian Affairs

For the purposes of this chapter, we will assume that the government owns the mineral licensing rights.

1.2. Obtaining Oil and Gas Rights from Government

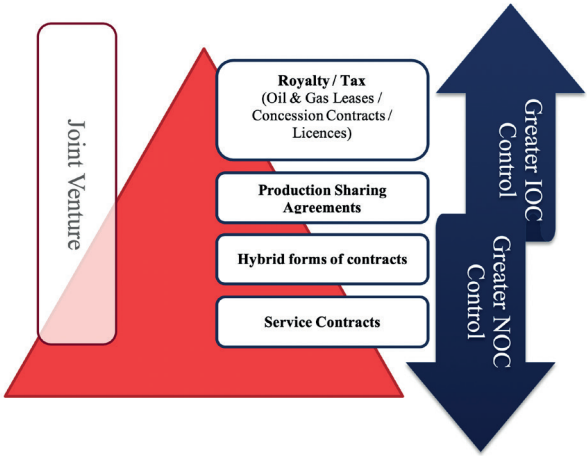
Generally, this process is regulated by a series of «licensing rounds», where the government approaches companies or advertises its intention to commence a licensing programme and requests interested companies to tender for oil and gas rights. This will usually be structured as a public procurement process, with some processes requiring bidders to pre-qualify pursuant to a Request for Qualification in order to show that, should its bid be successful, it has the necessary technical, financial and commercial capability required. The Request for Qualification is usually followed by a Request for Proposal.

Most oil and gas rights are issued pursuant to the licensing rounds, although rights can be issued through «out-of-round licensing». This would typically be the case where a company has conducted a certain amount of geological surveys, and believes there is a pending opportunity. A company may choose not to wait for the government to issue a Request for Proposal, and to rather approach the government directly on an unsolicited basis in an attempt to negotiate and obtain rights in respect to this area. Whether or not an unsolicited approach can be pursued will be dependent on the applicable procurement laws of the particular country.

When considering licence applicants, a government will look to see if a company has the necessary financial, technical and commercial capabilities in order to actually develop the resources, and may request to see the company's proposed development plan to ensure its feasibility and that it has adequately addressed any environmental or other strategic and operational issues. Some countries will also require a commitment to develop the local economy by setting certain localisation requirements in terms of equity ownership, procurement of goods or services or other social development obligations.

2. UPSTREAM CONTRACTS: TYPES OF HOST GOVERNMENT CONTRACTS

2.1. The schematic below depicts the form of typical Host Government Contracts



While governments may typically be the owner of the oil resources under the ground, they generally delegate the task of exploration and developing these resources to international oil companies (IOCs). The relationship between the government and the oil companies is regulated through the conclusion of a contract which caters for the rights and obligations of each of the parties.

There are a number of upstream contracts available when contracting with oil companies and other players in the industry:

[22] Or may not be able to wait where time is of the essence.

(a) Contracts which are based on a royalty or tax

Typically these are concessions or licences. A key feature of these contracts is that there is no shared production going to the state. The licensee owns all of the resources produced, but will be required to pay tax on its profits.

An exploration licence is a non-exclusive licence, granted in order for the licensee to carry out geoscientific surveys. A production licence on the other hand is a concession which grants an exclusive rights to conduct exploration drilling and production of oil and gas within a designated area.

Concessions are granted by state governments, and are typically granted to IOCs. The designated area is within that state's territory, either on state land or at sea. In return, the state receives royalties, a profit share, or possibly a share of the oil and/or gas produced for the duration of the concession.

The terms of a concession are generally set out in a concession agreement. A concession agreement is a contract entered into between an IOC and a government, and may, for example, set out the rights granted to the IOC, the extent of the designated area it has been granted rights over, the term (length) of the concession, and the consideration the state will receive in return for the granting of the concession.

A licence generally imposes certain obligations and restrictions on licensees. For example, these may include certain obligations to carry out work, restrictions on disposal and changes in control, operational standards, and restrictions on flaring, payments of fees, royalties, bonuses and tax as well as liabilities taking into account the structure of the licensee.

(b) Participation Agreements (PAs) and Joint Venture Agreements

PAs are contracts entered into between companies such as IOCs. As an example, two IOCs may want to jointly explore and develop oil production in a particular area. Instead of establishing a new joint venture company to conduct this exploration and production, the companies sign a contract whereby each agrees to work together on the exploration/production. PAs can be short form or long form, with «PAs» being an umbrella term which covers all kinds of projects with varying lengths, areas, and scope. Generally speaking, the larger the area covered by the PA, the larger the complexity of the project; and therefore in such an instance the PA will be more detailed in describing each party's rights and obligations, and how risk is shared.

Alternatively, companies may establish a new, «joint venture» company to achieve the same aims above. The IOCs will be shareholders in this company, and the companies as shareholders will enter into a joint venture agreement, which is a contract that sets out how the company will be run.

(c) Production Sharing Agreements (PSAs)

PSAs are popular in the African continent and the Middle East and provide for greater control by governments over the national oil industry.

PSAs are concluded between oil companies and governments and/or the appropriate state enterprise or NOC. A PSA determines and grants the rights to prospect, explore and extract mineral resources from a specific area over a specified period of time.

PSAs are usually granted in terms of development phases and will often include similar obligations and conditions as licences do in respect to required work plans and relinquishment rights.

Typically a PSA grants the NOC greater control over how the area is developed. Under a PSA, the state takes a share of the production through:

- Royalties
- Production Sharing

PSAs are dealt with in further detail in chapter 4.

(d) Service Contracts

Examples of service contracts can be seen in Mexico and Ecuador. Host governments use this type of long-term contractual arrangement in order to acquire the international oil companies' expertise and capital, while still maintaining ownership of the oil.

A service contract may either be 'pure service contract' or 'risk service contract'.

- In a pure service contract, the oil company will perform the exploration and production in exchange for a fee, the recovery of their operational costs is guaranteed and will not be dependent the projects commercial viability. This is a low risk, low upside contract.

- In contrast, risk service contracts the oil company's recovery is directly linked to the commercial viability of the project. This is a higher risk, higher upside contract.

3. UPSTREAM CONTRACTS – TYPES OF COMMERCIAL AGREEMENTS

There are a number of commercial agreements that can be concluded between private parties to regulate their contractual relationships and obligations in respect of their upstream activities.

3.1. Commercial Agreements

(a) Joint Bidding Agreements

Where companies agree to bid for a specific licence, they may enter into a joint bidding agreement. This type of agreement is concluded before a joint operating agreement; however, it generally denotes that a joint operating agreement must be signed if the licence application is successful.

A joint bidding agreement provides the parties with a mechanism for allocating liabilities and financial commitments while attempting to obtain a licence.

(b) Farm In/Farm Out Agreements

A farm out agreement is an agreement where the owner of a production licence / party to a PSA enlists a farmee to provide certain contractually agreed services (such as drilling, testing etc.) in exchange for a participating interest in the production of the output of a licenced area.

The form of the agreement depends on the nature of the work, the nature of the consideration and other details which the parties have agreed. Although there are common or similar points, there is no standard form of agreement.

The important feature of this contractual arrangement is that it provides a means of managing asset portfolios outside of licensing rounds. Essentially, this arrangement allows for the holder of an exploration licence, by farming out, to share the risk and cost of exploration and development. The main issues to be addressed in a farm out agreement will be:

- nature and scope of the work obligation;
- performance standards and timelines;
- scope and timing of the assignment of interest;
- access and security of data;
- representations and warranties;
- default events and consequences; and
- government consent (to the extent required).

(c) Joint Operating Agreements (JOAs)

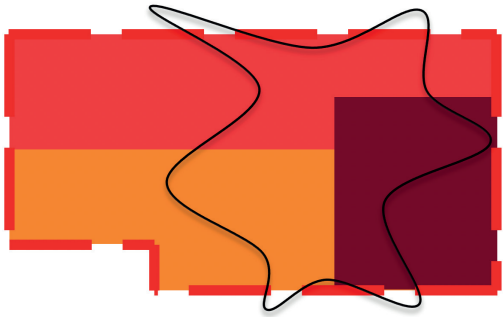
A JOA establishes a contractual relationship between participating members comprising exploration or production licensees or PSA contractors. This type of agreement is concluded to specify the terms on which the various parties to

a licence or PSA will work together to exploit the reserves. A joint operating agreement only comes into effect after a licence has been awarded / PSA has been signed and regulates all joint activities from the award of the licence / signing of the PSA to termination or surrender including exploration, development, production, lifting and transportation as well as processing/refining. The joint operating agreement also appoints an operator to conduct the operations on the behalf of the joint venture or consortium. This is a relatively standard form agreement, with the Association of International Petroleum Negotiators (AIPN) having drafted a standard form which is widely used in the industry.

The operator is typically wholly responsible for the operations (i.e. day-to-day management, and planning the conduct of the operations to maximise profitability), but the other parties (of which there may be many) who appoint this operator will generally have control over the conduct of future operations, and will have the ability to conduct inspections. Operators can be a designated party who act only as an operator; or they may have an interest in the revenues arising from oil that will be exploited.

(d) Unitisation Agreements

This an agreement by the owners of interests in a reservoir which extends into more than one licence area to develop it as a single unit. The areas although separated, are operated as if they are a single source and there are no boundary restrictions. The aggregate production is then allocated in proportion to their agreed tract participation in the deemed single block.



The benefits of this arrangement is that it prevents competition for resources, allows for increased profitability resulting from the enhanced recovery and a reduction of overall capital expenditure and operational expenditure by combining operations. It also allows for efficient operations and reservoir management.

(e) Decommissioning Agreements

These agreements are usually required by the government, and set out the content, planning and implementation of the decommissioning of oil and gas installations at the end of production. These are very often backed up by mechanisms to ensure that there are sufficient funds to undertake the decommissioning activities. Very often a decommissioning fund is set up which is designed to ensure that each of the parties to a joint venture that has any financial liability for decommissioning holds or deposits adequate financial security to meet its share of the total obligations.

(f) Drilling Contracts

Once the licensee has its rights, you need to start drilling. There are three main types of drilling contracts often based on standard form contracts with reference to the respective markets[23]:

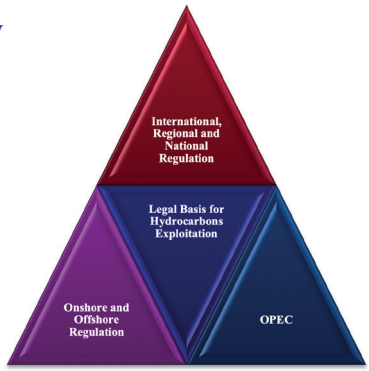
- ***Day rate contracts*** are the most popular. The operator of a drilling project will pay a day rate to the drilling contractor in exchange for the contractor providing the rig, the drilling personnel and other incidentals. While the contractors is responsible for specific risk, the operator assumes the general risk of drilling and increased costs. The contractor is paid even during periods of downtime, but at a standby rate.

- ***Turnkey contract*** in exchange for an agreed price the drilling contractor promises to perform specified functions, usually to drill to a certain depth. The contractor controls the operators and drilling methods and takes the risk of losing the well, delay and increased costs.

- ***Footage contract*** the drilling contractor is paid to drill to a specified formation or depth. The drilling contractor is paid a set amount per foot drilled, and is given broad control over how to do the work. The contractor assumes more well-related risks than under a day rate contract.

4. REGULATION OF OIL AND GAS

4.1. Overview



[23] AIPN are currently (2018) in the process of updating its standard form drilling contracts.

4.2. Legal Basis for Hydrocarbons Exploitation

The sovereign rights of a government and its people in respect of its natural resources is well documented:

- **UN General Assembly Resolution 626, 1952**

«the right of people to use and exploit their natural wealth and resources is inherent in their sovereignty»

- **UN General Assembly Resolution 1314, 1958**

Established permanent sovereignty of peoples and nations over natural wealth and resources

- **Commission on Permanent Sovereignty over Natural Resources UN Resolution 1803, 1962**

Resolution 1803 (XVII) provides that Countries and international organizations shall strictly and conscientiously respect the sovereignty of peoples and nations over their natural wealth and resources in accordance with the Charter of the United Nations and the principles contained in the resolution. These principles are set out in eight articles concerning, inter alia, the exploration, development and disposition of natural resources, nationalization and expropriation, foreign investment, the sharing of profits, and other related issues.

- **UN Charter of Economic Rights and Duties of Governments, 1974**

The Charter consists of a preamble, three chapters, and 34 articles. Chapter I addresses the «fundamentals of international economic relations,» chapter II lists the «economic rights and duties of states,» and chapter III considers the common responsibilities towards the international community.
Generally, the legal basis for hydrocarbon exploration is that hydrocarbons can be exploited by nations and their people in the first instance. This right to exploit hydrocarbons derives from a nation's sovereignty over its land.

4.3. Offshore Regulation

Offshore oil and gas reserves are typically governed by both international and domestic laws. In reality, offshore regulation depicts a more international element, as oil and gas deposits are often discovered outside of a nation's Exclusive Economic Zone (EEZ). Nations' EEZs are prescribed by the United Nations Convention on the Law of the Sea (UNCLOS)[24] , and are areas beyond and adjacent to a nation's territorial sea. They provide the nation with the right to explore, exploit, conserve and manage the natural resources in that area.

[24] United Nations: https://www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf

This results in domestic legislation being enacted in order to ensure that the economic burden of decommissioning and/or the fixing pollution rests with the producers.

- **UN Convention on the Law of the Sea**

UNCLOS provides the legal framework of offshore petroleum exploitation is based on exercise of the sovereign rights and the exclusive jurisdiction of coastal states in the EEZ and on the Continental Shelf (Art. 60, 76, 77, 80 and 81, UNCLOS).

UNCLOS confers sovereign rights upon coastal states, and in particular gives nations the exclusive right over the construction of offshore installations. The exercise of these rights must not infringe the rights of others. The UNCLOS acts as the principal international convention governing dumping and pollution at sea. It requires signatory states to ensure the removal of abandoned/unused offshore sites and to prevent a wide range of marine pollution. As a consequence, many nations have elected to legislate heavily against oil and gas producers to pass on the economic risk of pollution.

4.4. Onshore Regulation

Domestic laws and the production sharing agreements and/or licences mostly govern onshore regulation. It usually takes into account tax, corruption, anti-trust, employment, procurement, health and safety and environmental laws.

4.5. International Regulation

As is the case with the enforcement of all international regulations and treaties, it is dependent on signatories and nations voluntarily electing to be bound. Below are a few examples of conventions / standards applicable to the industry:

- ***International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Causalities, 1969***

An international maritime convention affirming the right of a coastal government to take such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty.

- ***The International Convention for the Prevention of Pollution from Ships (MARPOL) Convention 73/78***

Designed to combat oil pollution from vessels and is an importantly international marine environmental convention. This involves the fitting of appropriate equipment, including an oil-discharge monitoring and control system. MARPOL is divided into Annexes according to categories of pollutants including ship emissions.

• ***Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC 90)***

Parties undertake, individually or jointly, to take all appropriate measures to prepare for and respond to oil pollution incidents

• ***Maritime Safety Standards: e.g. International Safety Management Code***

Provides an international standard for the safe management and operation of ships at sea.

The general goal of these international regulations is to ensure the prevention and management of oil pollution by ships by applying international standards intended to limit such pollution.

4.6. Regional / National Regulation

Countries in the same region may form treaties or conventions to co-operate and protect each other. An example is the convention for co-operation in the protection and development of coastal regions of West Africa and Central Africa. Countries may also conclude a memorandum of understanding to give effect to such principles.

The regulation of the protection of investments is very important for the development of an oil and gas sector. The entry into of bilateral investment treaties and double tax treaties are taken into account by investors in considering investment into a governments' oil and gas sector.

4.7. OPEC

OPEC is a permanent inter-governmental organisation currently consisting of 16 members. OPEC was formed in 1960 by its five original founding members, being Iran, Iraq, Kuwait, Saudi Arabia and Venezuela.

The objective of OPEC is to co-ordinate and unify petroleum policies among Member Countries, in order to secure fair and stable prices for petroleum producers; an efficient, economic and regular supply of petroleum to consuming nations; and a fair return on capital to those investing in the industry.

Key points:

• Each country has its own laws that govern the ownership rights to natural and mineral resources, these sovereign rights are well documented:

• The relationship between governments and oil companies is regulated through various upstream contracts.

• In addition to local laws, offshore, onshore, international, regional and OPEC regulations govern the sector.

CHAPTER 4

INTRODUCTION TO PRODUCTION SHARING AGREEMENTS

This chapter outlines the history, concepts and key aspects of a Production Sharing Agreement. An overview of the key PSA features provides further detail on commercial terms, the regulatory framework, management, governance, the allocation of production and risk mitigation.

1. HISTORY

In 1960 the Production Sharing Agreement (PSA) concept was introduced in Indonesia by PERTAMINA when the Government of Indonesia enacted Law No 44 initiating 'Contracts for Work', as it wanted to have a greater degree of control over the development of oil and gas. This introduction effectively brought about an end to the use of concession contracts in the country.

The basic characteristics of this 1960s Indonesian PSA included:

- all assets owned by the Government were placed in service, with management in the hands of PERTAMINA (the Indonesian state-owned oil and natural gas corporation);
- international oil companies were given operational control in the field;
- work programs and budgets required PERTAMINA approval;
- major contracts and plans for development required PERTAMINA approval.

The PSA has become an increasingly used model, with various countries making use of PSAs including Argentina, Bangladesh, Bolivia, Cameroon, Chile, Egypt, Ethiopia, Malaysia, Vietnam, Yemen, Trinidad and Tobago, Equatorial Guinea, Georgia, India, Indonesia, Iraq, Kazakhstan, Kenya, Madagascar, Nigeria, Russia, Thailand and Uganda.

In the absence of a comprehensive petroleum law, a PSA often contains comprehensive rules and conditions pertaining to the activities to be undertaken in terms of the PSA.

1.1. Concept

A PSA is a contractual arrangement concluded between an IOC and the designated national oil enterprise such as a NOC, which authorises and regulates the undertaking of exploration and production activities within a given area. The IOC, often referred to as the contractor, carries out petroleum operations in accordance with works programmes and budgets which are approved by the NOC. The contractor is responsible for funding all costs of the approved works programme, including associated costs for exploration, development and production in respect of the field. The ownership of the resources remains with the Government and the IOC is not afforded an immediate ownership right in production nor any mineral or mining rights. The IOC only has an economic right to its share of the oil and gas resource once produced or once it reaches the delivery point.

Therefore, if as a result of the approved works programme there is no production, all costs will be a loss for the contractor. However, if the programme is successful then the contractor receives compensation in cash or in kind by reference to the production.

Generally a PSA is regarded as a risk contract as it incorporates a required production programme as well as minimum capital commitments, which the IOC must fund and adhere to. The Government or NOC is often afforded the option to contribute to the development costs and will often exercise this option in respect of costs following the commercial discovery of resources.

1.2. Key Financial Aspects of a PSA

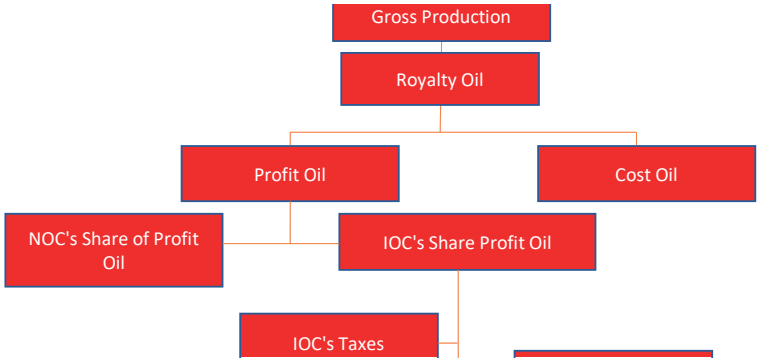
Production of oil is split into a number of categories as follows (and as further depicted in the diagram below):

- Royalty Oil, which is an agreed percentage of total production that is delivered to the government;

- After payment of royalty oil, a certain level of gross production can qualify to meet costs e.g. expended capex or operational costs, which is allocated to the Contractor (Cost Oil);

- the ICO and NOC then split the remainder of the cost reimbursement (Profit Oil) in a predetermined ratio; and

- the IOC pays local income taxes.



The split between profit oil and cost oil will tend to vary from country to country as it largely depends on the risk profile of the investment, taking into account:

- the role of the government in the development of the field and its funding undertakings;

- whether there are high social and political risks in the country; and
- the characteristics of the oil and gas field, whether it is offshore or onshore.

The IOC will usually take title to the oil at the point of delivery as defined in PSA.

1.3. Government take

Host governments will be entitled to revenue from any PSA. The share of the revenue which they receive from oil production is known in the oil industry as the «government take». The revenue they receive typically derives from royalties, taxes, and through having a share in the profit oil. There is typically a relationship between these three sources of revenue. If a government receives high royalty payments and a large share of the profit oil, it usually imposes less tax on the company[25] . Government takes may be fixed (i.e. a fixed percentage of the profit oil), or this profit oil percentage take may vary on the volume of oil produced[26] .

2. OVERVIEW OF THE KEY TERMS AND ISSUES

2.1. Key Issues

Certain aspects of the PSA require heavy negotiations as outlined below:

- ***Commercial terms***

  - description of the contract area;

  - contract duration including timelines to complete exploration and production activities. If no commercial discovery is made within the explorations phase, the PSA will terminate;

  - exploration works programme including timing of milestones, capital expenditure and evaluation criteria to determine whether or not the discovery is commercial. Only discoveries declared to be commercial may be developed;

  - ownership of movable and fixed assets. The government usually acquires ownership of the fixed and floating assets. The contractor has the right to use the assets and recovers the cost of the purchase of the assets out of cost oil;

  - the sale of production. The Contractor usually has the unfettered right to sell its share of cost oil and profit oil. Sometimes there is an obligation to supply the domestic market in addition to the allocation of royalty oil (more often for gas than for oil);

[25] Bindemann, Kirsten. «Production-Sharing Agreements: An Economic Analysis» (1999), Oxford Institute for Energy Studies, WPM 25
[26] Bindemann, Kirsten. «Production-Sharing Agreements: An Economic Analysis» (1999), Oxford Institute for Energy Studies, WPM 25

- approval procedures and cost verification provisions.

• ***Regulatory issues***

government regulations may require that the PSA contains certain national economic interest provisions relating to localisation requirements, technology transfer or domestic supply obligations in respect of goods and services.

Regulations may also regulate the right to export production, the retention of sales revenue outside of the country, the right to repatriate profits and the right to access infrastructure. Regulations may be sector specific or generic to various activities undertaken by the contractor, and compliance with all regulations is mandatory from a bankability perspective.

• ***Management and governance***

There is a large degree of control by the NOC of the exploration and production programme which is exercised in a number of ways, either through approval rights or NOC involvement in a joint operating company through the management committee.

The differing roles of the NOC and IOC, and degree of control exercised by each, can lead to conflict. These include conflicts around the supervision of operations, the process for approval of development / production plans, determination of commercial discoveries, the composition of governance structure and decision making. For example, the contractor will only wish to develop a discovery if there are sufficient resources to develop the field economically. The NOC, however, may want to develop the field regardless of its economics / commerciality for other strategic reasons including security of supply purposes. These issues are usually negotiated at length to ensure a balance of power between the NOC and the Contractor.

As there are often inherent conflicts of interest between NOCs and the contractor, a robust investment protection framework is generally required to regulate, amongst other things, the contractor's ability to repatriate profits, the expropriation or nationalisation of assets and property and dispute resolutions issues.

2.2. Allocation of Gross Production

The allocation of production is generally split as follows:

(a) Royalty Oil

The first portion of production revenue accumulates to the government and is normally in the region of 10-15% of total production, depending on the level of total production. Royalties will often be linked to production tranches, where a higher production tranche will result in a higher royalty.

(b) Cost Oil

An IOC must be able to use their allocated share of production to recover the costs it has incurred. Costs will be categorised by recoverable costs or non-recoverable costs. In general, the categories of recoverable costs include exploration / appraisal costs, production, capital costs and associated operating costs. Negotiable categories of recoverable costs include production bonuses, royalties, financing costs or interest expenses, although these are generally not recoverable.

The government has an interest in limiting the contractor's claim on cost oil to maximise its portion of profit oil. There is usually a cap on cost recovery, where only a certain percentage of production is allocated for cost recovery each year (known as the «Cost Ceiling»). Cost Ceilings are negotiable, and range from 20% to 100%. The valuation of a Cost Ceiling can depend on the category of expenses and will also be dependent on the position adopted by the government and the characteristics of the specific field.

A PSA will generally include a right to carry forward costs not recovered in a particular period due to a cap on recoverable costs for that period. PSAs also usually include ring fencing provisions that are designed to prevent contractors from «gaming» the cost oil system via cost cross subsidization. PSA ring fencing provisions will usually attempt to limit the recovery of all costs associated with a given block or licence to the revenues generated within that particular block.

Cost recovery is generally done on a sliding scale based on «R-Factor». The R-Factor is the ratio of cumulative receipts from the sale of petroleum to cumulative expenditures. The ratio is initially zero during the exploration phase as there is no sale of petroleum. Following the exploration phase, a R-factor below 1 would mean that costs have not been fully recovered yet i.e. total expenditure exceeds total revenue, whereas the larger the R-factor, the more profitable the operation. The royalty rate or the government's share of production may increase with an increasing R-factor.

There are a number of factors to be considered when determining the principles governing cost oil, which include:

- ***Valuation of oil***: if the discovered oil is valued as being higher than the objective market value, cost recovery will be disadvantageous to the contractor. The cost recovery oil allocated to the contractor will be worth less than the value attributed to it under the PSA valuation and the contractor will not fully recover its costs. The parties should agree an objective criteria in valuing oil, such as the free-on-board prices as published in internationally recognized trade journals. Limitation on depreciation: a distinction is usually made between exploration, capital development and operating

costs. These costs may be recoverable taking into account the rules of amortisation and depreciation which differ per country. Under a PSA, there can be an additional limitation on the investment by limiting depreciation allowances on certain project assets. The provision of favourable fiscal incentives pertaining to deductions and appreciation allowances can assist contractors faced with high costs of operation. Typically, these limitations will be applied to capital costs such as development costs.

• ***Contracts Approval***: cost oil is not assigned to expenditure incurred under a contract (e.g. a drilling contract) before approval under the PSA of that contract has been granted, which can delay recovery of costs to the detriment of the contractor's discounted cash flow economics.

• ***Auditing and pre-auditing procedure***: expenditure is investigated and judged against the depreciation rules and criteria of recoverable costs set out in the PSA or in the governing fiscal framework. Where pre-auditing is used, it should take place in the shortest time possible to avoid operations being stopped based on a lack of funding.

• ***Cost uplift / Investment Credits***: where any cost recovery ruling has been delayed, the quantum of such costs may be uplifted by an agreed interest factor to compensate the contractor for such delay. Cost uplifts and investment credits are usually not tax deductible.

(c) Profit Oil

• The sharing of profit oil between the government and the contractor is complex as it involves sharing in unequal proportions. Profit sharing provisions may be fixed, negotiable or subject to bid. Early PSAs were based on a flat, fixed percentage of oil after cost recovery, accruing to the contractor with the balance accruing to the government or contractor.

• From the NOC's perspective this was inadequate as flat rates did not address profit variances due to:

- different field sizes;
- development of infrastructure;
- technological advances; and
- dramatic changes in oil price.

• However, now profit oil is linked to certain methods, where modern PSAs are often based on a sliding scale linked to:

- Project profitability, whereby the government collects a share of cash flows in excess of the specified internal rate of return thresholds; or

- the R factor, which is a ratio of the cumulative expenditure to cumulative income, (otherwise known as investment multiples or revenue / cost ratios). R factors are easier to establish and to audit than profitability factors.

• Often the contractor's share of profit oil is taxable. Tax is levied on profit oil share pre split or post-split. If the IOC's share is not taxable (or the IOC's tax is deemed paid out of the NOC profit share) then generally the NOC's profit oil share is higher.

(d) Tax Oil

• The contractor will be subject to any law that imposes tax on income or profit. In some countries there are special petroleum income tax laws. The value of tax oil represents the monetary amounts of income tax that has to be paid to the government. The payment of income tax, the delivery of royalty oil and the sharing of profit oil are all part of the benefit that a government receives.

• Taxes are generally calculated using the standard methodology which is income less deductions. Income tax is usually applied to the Cost Oil plus the share of profit oil that an IOC receives. There are several tax incentives which may be applicable including the ability to deduct costs and depreciate investments. What costs can be recovered and how depreciation can be effected are key negotiation points. Some PSAs provide that the Contractors' tax is effectively payable by the NOC out of its allocation of Profit Oil.

(e) Bonus Payments

There are three types of additional payments which the government is usually able to negotiate:

- a one-time payment upon execution of PSA;
- a monetary amount payable within a period of the date of commercial discovery; and
- a recurring payment, subject to agreed parameters on each production tranche.

2.3. Reconciling Interests

While the NOC shares the same objective as the contractor in finding and extracting petroleum in an optimum manner, the NOC does not share the contractor's economic and financial constraints since it is not compelled to ensure a suitable return on its investments to its shareholders. There are different economic yardsticks applicable to each party. For example,

when the NOC is interested, in the context of national energy supply policies, to develop a natural gas discovery which is too small for an export project but large enough for supplying the local gas market. This could be in order to supply gas to a power station or industry located near the possible gas field, and so the contractor may be obliged to sell gas on non-commercial conditions including subsidized prices below market value and payable in local currency.

IOCs will tend to be driven by a number of factors, including reserve replacement, return on investment, acceptable pay-out times and access to markets. NOCs may be driven by other factors including development of the downstream industry, fuel diversification, import substitution, security of supply and access to technology and expertise.

To address such issues the parties will need to negotiate a middle ground, which is often addressed through having:

- sole risk provisions to allow the NOC to develop at its own risk areas which are not of economic interest to the contractor; and

- wider buy back options to allow flexibility for the NOC and/or the contractor to buy back into sole risk projects (at a premium).

The development of a fully integrated risk matrix across the full value chain of the project underpinned by a fully integrated financial model will assist parties in determining sustainable commercial positions and the appropriate allocation of benefits and risks.

Key points:

- The Production Sharing Agreement concept was introduced in 1960 by the Indonesian government.

- Generally, a PSA is regarded as a risk contract as it incorporates a required production programme as well as minimum capital commitments.

- Certain aspects of the PSA require heavy negotiations such as the contract area and duration, exploration works programme, asset ownership, sales and approval procedures.

- The allocation of production is generally split into Royalty Oil, Tax Oil, Cost Oil, Profit Oil and bonus payments

- The split between profit oil and cost oil varies and depends on the risk profile of the investment, the role of government in the development of the field and its funding undertakings; political risks and the characteristics of the oil and gas field.

CHAPTER 5

MIDSTREAM OIL & GAS

This chapter looks at the midstream oil and gas sector, and the various activities that form its parts. It provides details on the transportation, processing, refining and storage of oil and gas. It also offers a detailed comparison of Liquified Natural Gas (LNG) and Pipeline Gas and provides more information on the LNG sector.

1. THE MIDSTREAM IN CONTEXT

The midstream sector of the oil and gas supply chain provides a conduit between the upstream and downstream processes. For example, the transportation of oil and gas is critical in linking the production component of the oil and gas value chain to the industrial and residential markets.

The classification of midstream activities can vary between countries but generally includes the processing/refining, storing, transporting and marketing of oil, natural gas and natural gas liquids. The activity of refining is categorised as a «midstream» activity in some jurisdictions and a «downstream» activity in others e.g. in Nigeria.

2. TRANSPORTATION OF OIL AND GAS

2.1. Means of Transportation

There are various means by which oil and gas may be transported. The most commonly used forms include pipeline, rail, roads and marine vessels.

(a) Pipelines

Pipelines are the backbone of the industry as they ensure uninterrupted supply at the desired flow rate and pressure from the production source to the delivery point. Capacity can be added by constructing an additional pipeline next to the original line or via additional compression on gas pipelines or pumping stations on oil pipelines.

The use of pipelines is generally more common for land transportation, although there are a few sub-sea pipelines. In offshore production, pipelines are often used to move crude oil from the wellheads to offshore storage and ship loading facilities.

Most countries have specific legislation regulating pipelines and pipeline-specific regulatory bodies. Areas falling within the ambit of pipeline regulation would include design and capacity, route selection, pricing, safety and environmental, third party access and standards of operations.

Pipelines are generally commissioned and invested in by governments, political unions such as the European Union, or development banks such as the European Investment Bank. The European Union's 'Connecting Europe Facility' program has seen EUR 30.4bn of infrastructure investment . Projects are often overseen by engineering and project management service providers.

Pipelines are generally operated and/or maintained by pipeline operating companies. These companies can be independent private companies, but may also be joint ventures between NOCs, IOCs, and governments.

(b) Rail

This form of transportation is regarded as being one of the most safe and efficient forms of land transportation. It also has a low capital cost requirement.

(c) Road

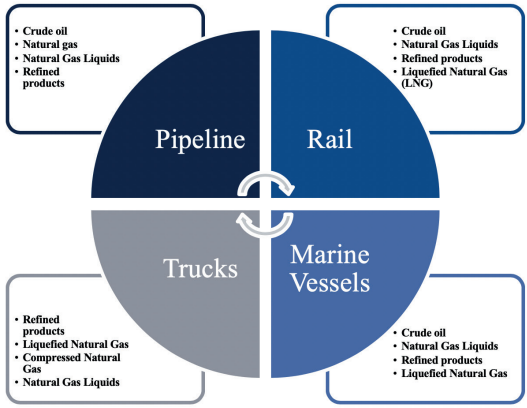
While not the most efficient means of transport, the use of road tankers allows flexibility in reaching remote areas. Road tankers are not a suitable transportation method for transferring crude oil but are often used for transporting refined products.

(d) Marine Vessels

This method of transport includes the use of tankers and barges, including Very Large Crude Carriers or LNG carriers. This is an extremely efficient means of transport, as a typical 30,000 barrel tank barge can carry the equivalent of 45 rail tank cars at about a third of the cost.
The use of marine vessels negates the geographic restrictions of pipelines and creates new customer markets.

2.2. Factors to consider when deciding the method of transportation

The diagram below outlines the key considerations for deciding the appropriate method of transport.



[27] Source: European Commission 'Connecting Europe Facility': https://ec.europa.eu/inea/en/connecting-europe-facility.

The diagram below outlines other considerations, in addition to those depicted above, for deciding the appropriate method of transport.

Consideration	Pipeline	Rail	Trucks	Marine Vessels
Shorter transit time	●			
Cost	●			
Large volumes	●			●
Long distance	●			●
Flexibility + Less reliance on infrastructure (and attendant capex)			●	●
Energy efficiency	●			

2.3. Regulatory and Environmental Considerations

In order to construct and operate a pipeline there are certain regulatory and environmental considerations that must be adhered to. Some of these considerations are listed below, though this is not a comprehensive list:

- Before beginning construction, it will be necessary to conduct an environmental impact assessment (EIA) study and obtain regulatory approval of the relevant environmental authority.

- It will be necessary to obtain and/or consider any existing right of ways/ servitudes in respect of the pipeline route as well as ensuring adequate compensation for the acquisition of such land rights. In some instances, it may be necessary to expropriate land pursuant to national legislation.

- Following a thorough application process, an oil and gas pipeline licence must be obtained. Additional permits may be required, including in respect of applicable pipeline or petroleum related legislation.

- Construction does not occur in isolation and the applicable health and safety regulations will need to be complied industry measures.

3. GAS PROCESSING

Oil and gas wells produce a mixture of components, including oil, gas, condensate, water, salt, nitrogen, carbon dioxide, solids (such as sand, dirt, scale and corrosion products from the tubing). It is therefore necessary to process such constituents in order to transform oil and gas into hydrocarbon forms ready for commercial use.

Processing also ensures that the oil and gas is capable of meeting pipeline specification before transportation so as to avoid damage to the pipeline during transportation.

The aggregated petroleum produced in various wells is first gathered through small diameter gathering lines, which eventually deliver natural gas to designated processing plants and separation facilities. The objective of the separation facility is to separate natural gas and water from the crude oil that was extracted from the production wells.

Once gathered and separated, processing occurs through the extraction of imbedded natural gas liquids, the removal of water vapour and impurities and the compression and dehydration of natural gas as well as the removal of hydrogen sulphide and carbon dioxide.

4. OIL REFINING

4.1. Oil refineries

An oil refinery is an industrial processing plant that converts and refines crude oil and other liquids into many more useful petroleum products. The process is described in further detail in section 4.2 below, but generally includes:

- Dehydration, to remove water;
- Compression, to strip of natural gas liquids (pentane and heavier);
- Absorption, to strip out liquefied petroleum gas (LPG) (propane and butane); and
- Process of removing ethane, although this is sometimes left if there is no nearby market for ethane, and the ethane rich gas may have little value to the market.

The aim of refining is to increase the crack spread, which is the difference between the input cost (crude oil and other costs) and the output prices of refined products.

The range of products will depend on:

- ***The market***
  Refineries are usually configured to produce products that are in higher demand / of higher value in that market (which can be seasonal).

• ***Specification of the feedstock crude***

Lighter (less dense) and sweeter crudes have a higher share of light and high value products like gasoline, jet fuel and diesel.

• ***The refining process and its complexity***

Complex refineries are able to extract more value from a barrel of oil by being able to produce higher value products from heavier or sourer crudes by multiple processes.

The range of products produced includes:

• Light Distillates, such as LPG, gasoline / premium motor spirit, light naphtha, and heavy naphtha;

• Middle Distillates, such as kerosene/ jet fuel and diesel;

• Heavy Distillates, such as heavy fuel oils, wax, lubricating oils, and asphalt;

• Others such as petroleum coke and sulphur.

4.2. The Oil Refining Process

Refinery operations are complicated and differ from location to location but consist of three basic processes for separating the crude oil into various product components. The stages of refining include:

• ***Separation through Fractional distillation***

This involves heating up crude oil that is fed into a distillation column, and allows for the separation into petroleum components called «fractions». The fractions are captured separately. Each fraction corresponds to a different type of petroleum product, depending on the temperature at which the fraction boils off the oil. During the distillation process the light fractions rise to the top. Medium weight liquids, including kerosene and distillates, stay in the middle and heavier liquids, called gas oils and fuel oils, separate lower down in the distillation tower, while the heaviest fractions with the highest boiling points settle at the bottom of the tower.

• ***Conversion***

This involves the refining of heavier fractions into lighter products, such as gasoline. «Cracking» is the most widely used conversion method. It is called «cracking» because it uses heat, pressure, electrolytes or hydrogen to crack/ split heavy hydrocarbon molecules into lighter ones.

- ***Treatment***

This involves combining a variety of streams from the refinery units to create a product blend.

Each step is designed to maximize the added value to the materials refined. Generally, the simpler refineries will only perform the first and third stages while the more complex will include more conversion or other refining processes.

4.3. The Nelson Complexity Index (NCI)

NCI is a pure cost index used to measure the complexity of a refinery, relative to other refineries. It does this by comparing the costs and capacity of various upgrading units against the cost of the primary crude distillation units. Refineries will be considered as «complex» (having a higher NCI) if they are able to produce lighter, more valuable products from heavier or sourer crudes.

4.4. Location of a Refinery

In order to determine the ideal location for the construction of a refinery there are a number of key considerations. These include:

- ***Crude supply***

Availability and proximity to pipeline infrastructure and ports.

- ***Product evacuation***

Proximity to evacuation pipelines, distribution terminals and ports,

- ***Power supply***

Availability of power to operate the refinery

- ***Distance from residential areas***

- ***Colocation***

New refineries are set up in proximity to existing refineries to share infrastructure.

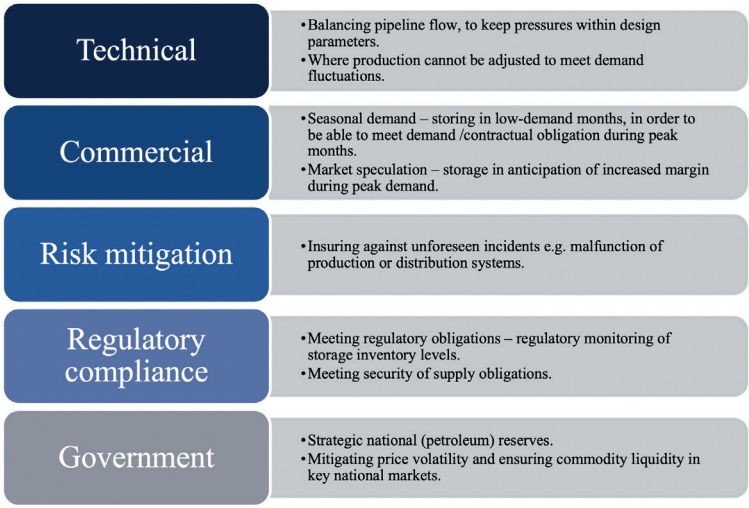
4.5. Refinery case study: Nigeria

The new Nigerian economy is largely dependent on imports of refined products, despite the existence of considerable reserves of crude oil. In Nigeria, amongst the barriers to any potential investment are pricing, limited infrastructure with an inadequate pipeline network, and risks related to currency availability and convertibility. Nigeria currently has five refineries, four of which are State-owned.

These refineries were built in the 1980s and are currently operating at a rate of 15% to 25% of their capacity utilization. The Nigerian Government is currently negotiating with investors to finance the rehabilitation of refineries with the aim of reaching a capacity of 90%. A new refinery with a capacity of 650 000 b/d is under construction, and is expected to be completed in 2022. This project is sponsored by the Dangote Group and funded by a combination of international lenders, export credit agencies and development finance institutions.

5. STORAGE OF OIL AND GAS

5.1. Storage principles



5.2. Oil Storage Methods

The oil storage methods include tanks, underground caverns and floating storage and offloading units (FSO). There are a variety of tanks available such as floating storage, open top tanks, fixed roof tanks, floating roof tanks and floating roof tanks.
FSOs are suitable for remote, deep water locations as they eliminate the need to lay expensive long-distance pipelines. They are also flexible and can be moved to a new location once the field is depleted, however they do not have the capability for oil or gas refining/processing.

A variant is the floating production, storage, and offloading vessel (FPSO). FPSOs are commonly used for offshore production in locations that have little existing infrastructure. They serve as gathering, refining/processing and storage facilities for fluids produced from subsea wells. Crude oil is then refined using equipment on the ship's decks, where the fluids are stored in the ship's hull before they are offloaded to pipelines, barges, or ships. Produced natural gas may be sent to shore via pipeline or flared if no pipeline is available.

In the LNG industry the following may be used:

- a floating storage and regasification unit (FSRU). The use of FSRU vessels is a relatively recent development. FSRUs can be developed either as a separate unit aboard a LNG carrier or by converting an old gas carrier into an independent unit. A FSRU can be moved from one location to another.

- a floating liquefied natural gas units (FLNG). The FLNG vessel can be used to produce, liquefy, store and transfer LNG (and potential LPG and condensate) at sea before distributing it to markets. The world's first completed FLNG production facility is the PFLNG Satu located in Kanowit gas field off-shore of Sarawak in Malaysia.

5.3. Gas Storage Methods

When considering gas storage methods, the following terminology is important to understand:

- ***Total gas storage capacity***

Maximum volume of natural gas that can be stored in an underground facility.

- ***Total gas in storage***

Volume of gas in the facility at a particular time.

- ***Base gas (cushion gas)***

Volume of natural gas intended as permanent inventory in a storage reservoir to maintain adequate pressure (for deliverability) throughout the withdrawal season.

- ***Working gas capacity***

Total gas storage capacity minus base gas.

- ***Deliverability rate***

A measure of the amount of gas that can be withdrawn from a storage facility on a daily basis.

- ***Injection capacity/rate***

The amount of gas that can be injected into a storage facility on a daily basis. Natural gas is often stored in underground facilities, such as depleted reservoirs, salt caverns and aquifers.

A depleted fields reservoir is a reservoir formation of a natural gas field that has produced all of its economically recoverable gas. This storage methodology takes advantage of existing wells, gathering systems, and pipeline connections.

The base/cushion gas requirement in respect of a depleted field reservoir is approximately 50% of total gas capacity. For salt caverns the base/cushion gas requirement is approximately 33% of the total gas capacity of the storage reservoir. For aquifers (porous and permeable rock formations that act as natural water reservoirs) the base/cushion gas requirement may be much higher, of up to 80% of total gas capacity.

Other possible storage methods include:

- ***LNG storage tanks***

  Consist of cryogenic tanks that can be land-based or floating.

- ***Pipeline capacity***

  Provides temporary storage through a process called «line packing». Line packing occurs by packing more gas into the pipeline by an increase in the pressure of the pipeline.

- ***Gas holders***

  Consists of above ground storage, largely for balancing the gas supply and is not a long-term storage solution.

6. LIQUEFIED NATURAL GAS (LNG) VS. PIPELINE GAS

6.1. What is LNG?

Liquefied Natural Gas (LNG) is natural gas that has been cooled down to liquid form for ease and safety of non-pressurized storage and transport. LNG developed to overcome pipeline restraints.

LNG is roughly 1/600th the volume of natural gas or atmospheric pressure. The LNG value chain consists of a refrigeration complex with a marine interface. LNG is loaded into special ships with cryogenic tanks for sea-borne transport to designated customer markets. LNG receiving terminals receive, store and re-gasify the LNG. The LNG receiving terminal can be land-based or floating.

The LNG trade began in the early 1960s, with resource-rich countries like Algeria shipping LNG to the UK, and Abu Dhabi shipping to Japan.

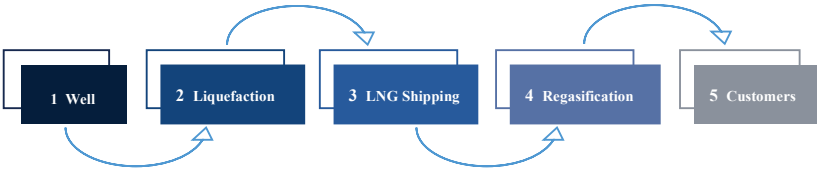
As the LNG market began to develop, the regional markets developed independently of each

other, as a result of the high cost of transporting natural gas. The two distinct LNG trade regions were the Asia-Pacific region and the Atlantic Basin region. The two regions were largely separate, with unique suppliers, pricing arrangements, project structures and terms until Qatar began to export to both regions in the mid-1990s. Recently with the inter-regional trade increasing, the line between these two distinct regions has begun to blur.

While previously the LNG industry was somewhat inhibited by the lack of LNG carriers available, the cost of building a vessel has dropped substantially which has allowed for more carriers to be built. Since the LNG trade begun in the 1960s, the industry has seen substantial growth due to technological advances.

6.2. LNG Process and Value Chain

The LNG process and value chain is depicted in the schematic below:



Once natural gas is discovered and extracted from the well, it is converted into a liquid state through the process of liquefaction, whereby LNG is created by the technology of cooling natural gas to -163°C in order to convert it from a gas to a liquid. This process reduces its volume by about 600 times, making natural gas more economically efficient to transport.

Volume reduction allows alternatives to pipeline transport. The primary modes available to transport LNG are by sea and truck and in a few locations by rail.

LNG carriers are a blend of conventional ship design with specialized materials and advanced systems for handling cryogenic cargoes. The total global LNG fleet currently stands in the region of 600 vessels. Currently around 499 ships are in service and 101 ships are on order. New building orders in early 2018 have been supported by the competitive yard prices. As an example, Daewoo Shipbuilding & Marine Engineering secured orders for four ships each costing around USD 183M (10% less than prices in 2015).

Trucks transport cryogenic containers to the designated market. Several jurisdictions are currently engaged in regulating transporting LNG by truck, including but not limited to the USA, Japan, Korea, the UK, Norway, Germany, Belgium, Spain, Portugal, China, Brazil, Turkey and Australia.

Once the LNG reaches its destination, it is then converted back into a gas state at a regasification plant (Regasification). The diagram below outlines the re-gasification process:

Regasification occurs at LNG terminals. These regasification facilities can be either onshore or offshore. Floating barge mounted plants have the advantage that they can be towed to new offshore locations, which provides for flexibility in response to changes in the business environment.

The regasification process involves raising the temperature of the LNG above 0°C. This is achieved through the use of different types of vaporisers:

- ***Open Rack Vaporisers***

  Uses the heat from seawater to regasify the LNG.

- ***Submerged Combustion Vaporisers (SCV)***

  Burns the natural gas produced by the LNG terminal and then passes the hot gases into a water bath containing pipes with LNG.

- ***Intermediate Fluid Vaporiser (IFV)***

  Two levels of thermal exchange. A heat source, such as seawater, heats an intermediary fluid, such as propane, to warm and regasify the LNG. IFV's prevent freeze-up and reduce fouling risks.

- ***Ambient Air Vaporisers***

  Uses heat from the air to regasify the LNG.

The LNG terminals provide four main processes:

- Receiving and unloading of LNG from ships
- Storage or tanking of LNG
- Compression and regasification
- Transmission

The gas can then be distributed to the market where residential and commercial consumers receive natural gas for daily use from local gas utilities or in the form of electricity.

Key points:

- The midstream sector of the oil and gas supply chain provides a conduit between the upstream and downstream processes.

- The classification of midstream activities varies, but generally includes the processing/refining, storing, transporting and marketing of oil, natural gas and natural gas liquids.

- LNG was developed as an alternative to pipeline gas due to pipeline constraints.

- Once LNG is extracted, it is converted into a liquid state, which allows for the usage of alternatives to pipeline transportation, such as by sea, truck and sometimes rail.

- Regasification occurs at LNG terminals and is then distributed to the market.

CHAPTER 6

DOWNSTREAM OIL & GAS

The downstream oil and gas sector is described in this chapter, including a list of downstream products as well as the regulatory issues associated with transactions in this sector. The oil trading market is also outlined, with a description of contracts, key players and pricing. An overview of Gas Sales Agreements is provided, including the key provisions and components of these types of agreements. These agreements are compared to LNG Sales Purchase Agreements, the various provisions of which are also discussed.

1. THE DOWNSTREAM SECTOR

Typically oil and gas will be transported as part of the midstream sector to the downstream sector, where there are a number of suitable delivery points for the transport of oil and gas. The downstream sector specifically focuses on preparing and providing a product to the end customer, whether it is through the distribution, marketing, trading or retail storage of such products.

The downstream sector consists of varying types of refined/processed products which are distributed or marketed to different end customers based on the use of the product. For example, the product can be transported to retail service stations, petrol stations, airports, distribution pipelines, or gas cylinders. The following list of products and their uses provides an overview of the variety of products and their uses:

- ***Gasoline/Premium Motor Spirit:*** used as fuel for internal combustion engines, such as in vehicles, electrical generators, compressors etc.
- ***LPG e.g. propane and butane***: used for cooking, heating, refrigerant and fuel for vehicles.
- ***Kerosene (also called jet fuel, paraffin, aviation turbine fuel):*** used for cooking, fuel for jet engines, heating, lighting etc.
- ***Diesel:*** used as fuel for vehicles and external combustion engines.
- ***Lubricating oils:*** used for lubricant, motor oil and to prevent corrosion and rusting
- ***Paraffin wax:*** used for lubricant, input in candle making, wax
- ***Fuel oils (heavy oil):*** used for heating homes, fuel for ships and trucks, fuel for power plants and electrical generators
- ***Asphalt/Bitumen:*** used for roads, waterproofing and roof-sealing products
- ***Petrochemicals (benzene, toluene, xylenes, naphthalene, etc.):*** used for feedstock in producing fertilizers, wax, polish, detergents, food additives, dyes, plastic bottles, etc.
- ***Tar:*** used for disinfectant, to seal roofs and for hulls of ships.

2. REGULATORY ISSUES

Given the nature of the downstream sector, including the different uses of products and geographies of products in terms of where they are distributed and marketed, there are certain regulatory issues to be considered in any transaction. The following issues are the most commonly come across, although this is not an exhaustive list.

- ***Licences and permits:*** different licences and permits will be required depending on what the commodity is being used for e.g. for import, storage, retail distribution etc. The licences and permits will usually be required to be in place prior to carrying out any downstream activities and so the requirements and timeframe for obtaining approvals will need to be carefully checked.

- ***Trade compliance:*** depending on where the commodity is located or which jurisdiction it will be exported from/imported to, certain export control and sanctions regimes will need to be complied with, including any customs regimes of the jurisdictions involved. In many cases an export licence may be required. Consideration will also have to be given to any free trade zones / exclusive economic zones.

- ***Environmental Impact Assessment and other environmental considerations:*** depending on what the commodity will be used for and its location, an environmental impact assessment may need to be carried out. The assessment will usually determine if the products are harmful or if certain restrictions need to be placed on the use of the products or the quantity/ characteristics of the products.

- ***Anti-bribery regulations:*** the oil and gas market can be a high risk market and politically sensitive in certain jurisdictions. Certain jurisdictions will have strict anti-bribery regulations in place in order to avoid large fluctuations in the market. Any applicable anti-bribery regulations will need to be complied with.

- ***Local incorporation requirements:*** certain jurisdictions will have local incorporation requirements for the use or import of products in their jurisdiction, including any other resources or services associated with the products being provided. For example, there may be a requirement that only a certain percentage of products are to be imported in order to allow fair marketing of local products and resources.

Other regulatory issues to be aware of include:

- Price regulation;
- Health and Safety;
- Insurance;
- Competition regulations;
- Capital importation and remittances; and
- Cabotage regulations (right to transport goods or passengers between two places in the same state by a transport operator from another state).

3. OIL TRADING

3.1. Trading Contracts and Key Players

Not all products marketed go straight to the end customer, where some products form part of the trading market. Generally, trading contracts take two forms:

- ***Spot contracts***

Under a sport contract crude oil is traded immediately, with instant delivery and payment. A single shipment of oil can be traded up to ten times from the time it leaves a producing state to the time it reaches a port.

- ***Futures contract***

A futures contract is an agreement concluded between two parties to buy and sell a specified quantity of crude oil. The price of the crude oil is agreed upfront and delivery and payment are scheduled to take place at a specified date in the future. The main crude oil futures markets are the New York Mercantile Exchange (NYMEX) and the Intercontinental Exchange (ICE). These trading markets are dominated and influenced by major oil traders. The current key players are:

- Vitol Group, founded in the Netherlands and headquartered in Switzerland, which is involved in the physical oil trade;

- Glencore International, listed on the London Stock Exchange and headquartered in Switzerland, with its focus on trading metal and minerals, energy and agricultural products;

- Cargill, founded and headquartered in the USA, which focuses on areas such as agribusiness, energy trading, meat and food ingredient applications, biofuels production, animal nutrition products, and industrial products;

- Trafigura, headquartered in Switzerland but legally registered in Singapore, which focusses on crude oil products, non-ferrous, concentrates and refined metal trading and transportation;

- Koch Industries, founded and headquartered in the USA, which focuses on oil refining and transportation, petrochemicals, forestry and paper, and ranching;

- Gunvor International, headquartered in Switzerland but legally registered in Cyprus, which is largely focused on oil trading; and

- Mercuria Energy Group, founded and headquartered in Switzerland, which trades in crude oil and refined petroleum products, natural gas, power, coal, biodiesel, carbon emissions, base metals and agricultural products.

However, this list is not exhaustive and the key players are constantly changing depending on the fluctuations in the market.

3.2. Bill of Lading

As part of the international trading process, a bill of lading (BoL) is commonly issued. The BoL is a document issued by an oil carrier, which details a shipment of merchandise and gives title of that shipment to a specified party. It also provides evidence of the shipment of goods. This enable the goods to be traded afloat and triggers the payment mechanisms under the sale contracts and credit support agreements so that delivery of the goods can be effected.

3.3. Pricing Determinants

The price of oil can vary greatly. The spots contract is based on a price at the time the commodity is traded, which is determined by the market. In contrast the futures contract is based on a fixed price at the rate on the day the contract is entered into.

There are a number of factors that the pricing of oil is heavily determined by. For example, the price will be based on demand and supply, which is greatly impacted by how traders interpret the market e.g. whether they believe the demand of the commodity will increase or decrease over time. The price is also determined by geopolitical risks, where the price can dramatically drop or increase based on current affairs and decisions taken in major oil producing countries such as the USA or Saudi Arabia.

Crude oil is typically traded in US dollars and so the price will be determined based on the US Dollar value. Other price determining factors include market sentiments and psychology, and cartel arrangements e.g. by OPEC. As OPEC controls 40% of world's supply of oil, OPEC tends to influence the price determination of oil commodities. Recently the market has demonstrated that with the increase of non-OPEC output, OPEC's influence on pricing is waning.

With the price of oil being dependent on a number of factors, making it subject to fluctuations, the pricing formula and price review clauses need to be carefully considered in the gas sales agreement. This is covered in more detail in section 4.1 below.

4. OVERVIEW OF GAS SALES AGREEMENTS (GSA)

4.1. Key provisions of the GSA

It is important to recognise that there are a wide variety of types of gas sale agreement. For example, sales may be for production from a field to either a downstream power or industrial customer, possibly in a situation where alternative supply options are limited, or alternatively it could be to a trader or aggregator in a gas pipeline network or system where much greater flexibility exists.

LNG sales could be a direct contract from an LNG liquefaction plant to a customer, or could be from an LNG producer to an aggregator or from an aggregator to a customer.

Sales to end users could be from a single source or from a system where there are multiple potential sources and sellers.

As you can see from the diversity of potential contract types, it is both physical and market constraints in the gas industry which can have a big impact on the form of contract and its terms and, due to these physical and market constraints, the commerciality of gas production can be economically constrained.

The existence of infrastructure and the existence of a liquid market in either gas or LNG provides the flexibility to overcome some of these physical and market constraints, to mitigate risk and allow greater flexibility around the features that will support commerciality of gas field development or LNG production and so creates the conditions which allow greater flexibility of terms in the market.

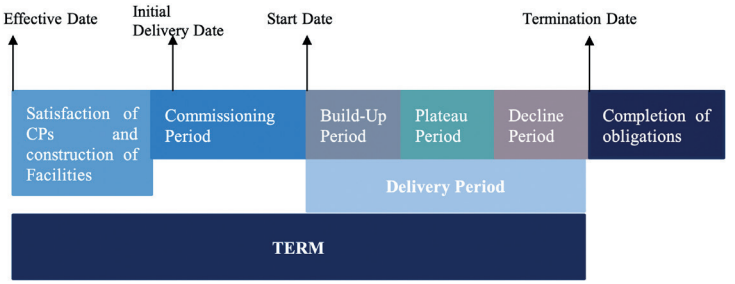
It is difficult in a document this size to examine in detail all the different types and mechanisms in the respect of gas sales agreements. In considering any gas sales agreements its always going to be important to carefully consider the fundamentals and in particular the commercial impact mitigants around supply or purchase delays or failures or arising from the price achieved or paid for the product. We can, for illustrative purposes, discuss just some of the features or mechanisms found in some of these gas sales agreements.

4.2. Key periods of a GSA

Depletion contracts are commonly used where there is a nominated gas field dedicated to the buyer. The contract quantities are based on volumes of gas economically recoverable and there is no obligation on the seller to secure additional reserves to meet its supply obligations.

The diagram below illustrates the distinct periods in a depreciation contract.

The effective date refers to the date on which the conditions precedent have been either fulfilled or satisfied and the date that the construction of the facility may begin. During the commissioning period the parties will test the new facilities. Once the start date is reached, the seller will be obliged to deliver gas in accordance with buyer's nominations. It is possible to fix the start date when the GSA is executed and impose damages for failing to achieve the start date within the prescribed period. It is also possible for the parties to agree to defer the start date until the construction has reached a certain phase, which is known as the window mechanism. The increases in quantities over the build-up period will depend on both likely field development scenarios and the customer's own requirements. At the end of the plateau period, once production goes into decline, the seller will issue notices under which sales volumes are stepped down until the termination date, the date at which commercial production no longer is viable.



4.3. Supply contract from a gas network

In contrast under a supply contract the seller commits to deliver a specific quantity of gas over a certain period. There is an obligation on the seller to secure additional reserves if the initial source of supply is inadequate.

The type of contract to be entered into will need to be carefully considered and will depend on what each party is trying to achieve and the nature of the transaction.

4.4. Contract pricing

It is in the interest of the seller that the gas price should remain certain and enable the seller to recover its capital and operating costs, as well as a reasonable return on its investment. The buyer, on the other hand, will push to ensure that the gas price remains competitive with the prevailing market price for competing fuels throughout the duration of the GSA.

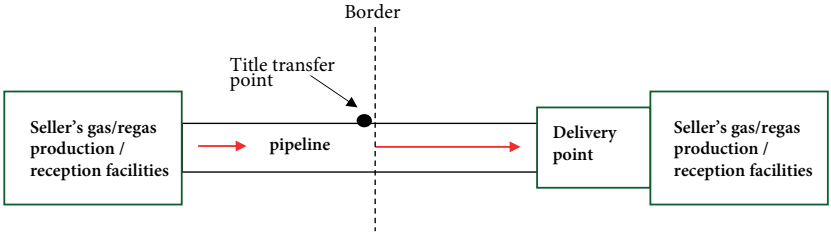
The mechanism for setting the contract price is generally heavily negotiated in the GSA. It can be referenced to reported prices for traded gas on the mature markets or may be an agreed base price which is periodically indexed by reference to an agreed formula. The GSA may contain a right for either party to periodically request a review of the price. This is often included where the agreed price formula is likely to no longer adequately reflect market conditions in the near future. In situations of price review, the GSA should cater for the parameters of the review, the frequency of the review, the information that is to be considered in the review and the consequences where parties fail to agree on a revised price.

Another pricing mechanism is «take or pay». A «take or pay» commitment refers to the obligation on the buyer to take and pay for, or pay for if not taken, a minimum quantity of gas within a specified period. This guarantees the volumes that the buyer will pay for and provides the seller with a secured revenue stream and assists the seller in securing the financing for the project. The commitment will normally be expressed as a percentage of the annual contract quantity subject to adjustments for non-delivered quantities (shortfall), occurrence of a force majeure event, and maintenance.

4.5. Title, Custody, and Risk Transfer

(a) Transport by Pipeline

The diagram below illustrates the transfer of title, custody and risk when gas is to be transported by way of pipeline. Title to and risk in the gas will pass from the seller to buyer at the physical border between jurisdictions as indicated on the diagram and the custody of gas will transfer at the delivery point.

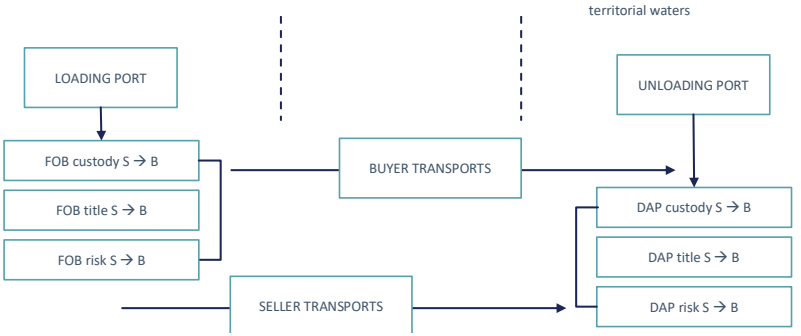


(b) Transport by Shipping

The diagram below illustrates the transfer of title, custody and risk when gas is to be transported by ship. Title to and risk in the gas passes from the seller to the buyer at the delivery point in one of two ways:

- at the seller's facilities by way of a Free on Board (FOB) contract. Under the FOB the seller provides the crude oil, oil product or LNG at a lifting installation, where all loading costs to put the commodity on board have been paid. However, the buyer takes responsibility for shipping and freight insurance; or

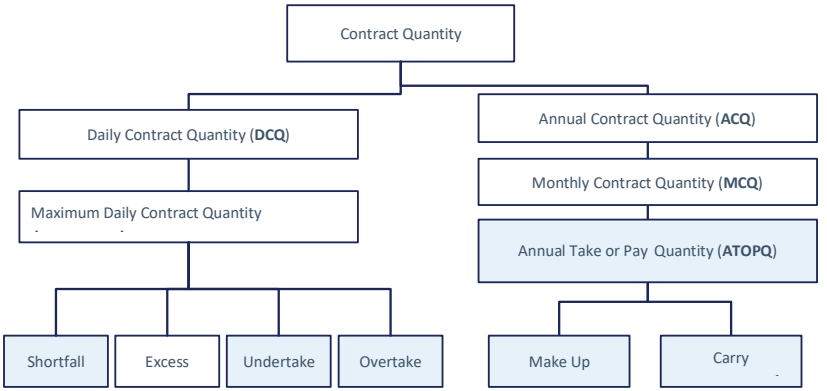
- at the buyers facilities, where it is delivered at an agreed delivery point (Delivered at Port or DAP). The seller takes on all the risks and costs of delivering goods to the delivery point.



4.6. Quantities

There are different quantities of gas negotiated in a GSA as the diagram below indicates. The buyer will usually seek to ensure that there is enough flexibility to allow it to manage its downstream demand, to minimize its obligations under the GSA, to ensure a reliable supply and to ensure that the market for gas is matched as closely as possible to the gas supplied.

The seller must ensure that it identifies how much gas it will be expected to supply over the life of the contract and will seek to restrict the level of flexibility afforded to buyer, ensure that the cost is passed to the buyer, and aim to minimize its own risk for failure to supply gas.



The essential components to consider in a GSA are as follows:

• Excess Gas: Excess gas is gas required by the buyer in excess of the agreed maximum daily contract quantity. The seller's obligations to supply the buyer in excess of the agreed maximum daily contract quantity is usually limited to a «reasonable endeavours» requirement. There is no obligation on the seller to deliver excess gas and therefore no shortfall liability for failure to deliver the same. However, the seller will be incentivized as such excess gas is usually sold at a premium to the contract price.

• Make-Up Gas: This results where the buyer has paid for gas pursuant to the take or pay obligation, but has not received the gas. The buyer will be entitled to nominate and receive the gas at a subsequent time during the term of the GSA. It is customary to include a time limit in respect of the supply of make-up gas, for example by providing for a limitation on the application of make-up gas in a year e.g., percentage of the annual contract quantity. The GSA should also regulate the consequences of outstanding make-up gas after termination of the GSA.

• Shortfall Gas: This applies where the seller supplies gas below the nominated quantity and the buyer can claim certain remedies for the shortfall. The remedies available to the buyer in the event of a shortfall arising are to receive a cash compensation, the right to procure alternative fuel and be reimbursed by seller or to claim a redemption at a discount.

However there are exclusions available for the seller's benefit including:

• if the gas was supplied but not taken by buyer; or

• where the gas was not delivered during the commissioning period or due to scheduled maintenance or a force majeure event. A shortfall will also be avoided if make-up gas is supplied.

4.7. Other Essential Components of the GSA

There are a number of other essential components that make up the GSA which should be considered by various players e.g. the commercial and technical teams. This includes:

• Gas specifications: Gas must conform to the agreed contract specifications agreed, which need to be reviewed by the technical teams. In the event that the gas delivered fails to meet the gas specifications set in the GSA (Off-Specification Gas), the following remedies will be available to the buyer:

• right to reject Off-Specification Gas and if rejected, off-specification quantity will amount to the shortfall gas;

•if Off-Specification Gas is accepted, payment for gas will be at a discount;

• an indemnification against any loss incurred for physical damage to the buyer's and transporter's facilities, including cost of clearing and cleaning facilities provided that such indemnity will not apply where Off-Specification Gas is knowingly take.

• Termination: Early termination events could include persistent failure to deliver the contract quantity, material breach of obligations, insolvency, prolonged failure to take the gas, and prolonged force majeure.

• Liability: With respect to general liability issues such as third-party claims that are not already covered by the GSA or by insurance cover, the remedies provided in the GSA are usually exclusive and exhaustive. The GSA should provide for a cap on total cumulative liability.

• Force majeure: In agreeing the definition of force majeure the definition should cover any local considerations, such as political turmoil (depending on the respective obligations) and any relief to be given. The occurrence of an event or circumstance that will make the performance of a GSA uneconomic or commercially impracticable is not considered a force majeure event. Equally excluded from the definition is the breakdown or failure of any equipment caused by normal wear and tear or failure to maintain equipment.

• Foreign exchange rate: The foreign exchange rate mechanism needs to be agreed upfront by the parties and included in order to limit currency risks. This is a key risk that needs to be addressed in countries facing political instability and is particularly applicable in Africa.

5. OVERVIEW OF AN LNG SALE AND PURCHASE AGREEMENT

5.1. What is a LNG SPA?

In contrast to the GSA, which generally covers delivery of gas by pipeline, the LNG SPA covers the upstream gas supply and/or liquefaction process, shipping and downstream regasification and the gas sales elements of the LNG chain.

There are potentially a number of different structures for LNG SPAs. Some contracts are for on a FOB basis while others are DAP (see section 4.5 above). Contracts can be long-term, short-term or spot. While some long-term contracts may be single source to single customer, more and more contracts in the LNG market involve sales to or by aggregators who can match their production and purchase portfolios with their sales portfolios in a way which provides greater flexibility on LNG sales terms.

5.2. Key Provisions

There are now standard form short term/ spot contracts for LNG sales produced by AIPN. For long term contracts there are industry standard forms, but a degree of consistency as to how a number of issues are addressed is required. Regulatory issues to focus on include:

(a) Seller's liability for delay or shortfall

The seller is usually held harmless from liability for the buyer's consequential damages suffered due to the seller's breach of its obligations. However, the buyer needs to consider whether they are adequately protected. The LNG SPAs are starting to incorporate language that establishes liability on the part of the seller for late and missed cargoes, through the inclusion of liquidated damages and the calculation of seller's liability.

(b) Force majeure

The two most commonly used laws for a LNG SPA are English law and the laws of New York, whereby such laws do not incorporate principles governing force majeure relief.

Therefore, the SPA needs to include events entitling the parties to relief if a force majeure event occurs. The definition of the standard of care apply to force majeure in relation to LNG shipping is also important, as well as whether the buyer is entitled to relief as a result of events affecting downstream facilities e.g. example transportation pipelines and customer facilities.

(c) Price and price review clauses

LNG is generally priced in relation to market indices. For the Asian market the pricing indexation is usually linked to oil, for example the Japan Crude Cocktail index for supply into Japan, as oil was the competitive fuel for LNG in that market. There is still a lot of volatility and uncertainty with pricing due to the opening of many new gas markets to LNG imports. By contrast for European markets where LNG is competing with pipeline gas, a netback from gas system market prices is generally used.

Price review clauses generally feature in long-term LNG SPAs due to the price risk. There are key elements to address when negotiating a price review provision, such as the trigger event entitling a party to invoke the price review procedure. Further, the elements of the price mechanism subject to review must be defined e.g. base price, indexation, floor price, ceiling price. The clause should provide for a benchmark which is to be applied in order to determine the revised price mechanism.

(d) Specifications and off-specifications of LNG

Quality specifications are generally found in an annex to the LNG SPA. However, it is important that the LNG SPA drafting is clear on whether the quality specification is an «as loaded» specification (applicable for FOB sales) or an «as unloaded» specification (applicable for DAP sales).

The Buyer can reject «off-specification» LNG, if the specification is not physically or commercially feasible, and the Buyer is entitled to reimbursement for direct and verifiable actual out of pocket costs incurred in receiving, treating and/or disposing of LNG due to it being outside of the quality specifications. The seller can limit their liability by applying a cap on the amount of reimbursement that may be claimed.

5.3. Trends in the LNG SPAs

There has been a shift in the bargaining power in favour of the buyer in LNG SPAs. For example, there has been increased pressure to remove the damages cap in respect of the failure to supply as well as there being less importance placed on the take or pay model.

Other shifts in favour of the buyer include:

- more pressure on the commencement of delivery (i.e. the start date) so that unexcused delays in supply result in shortfall and liquidated damages (sellers will then request to lower the test for full commission so that the start date can be achieved);
- imposition of a sunset date to terminate the LNG SPA if supply has not commenced;
- obliging sellers to provide alternative supply source; and
- obtaining better terms for early cargo.

Buyers are also seeking increased flexibility including:

- the right to cancel cargo both before the annual delivery programme and during the Contract Year;
- the right to divert (including cross border diversion);
- delayed timing to declare ship size for FOB contract;
- a put option to sell back to seller;
- the possibility of multiple port discharges; and
- for the expansion on definition of buyer's facilities in force majeure clauses.

There are also new trends emerging in LNG SPAs. For example, following the oil price crash in 2013 it triggered price-out-of-range clauses to allow price review. These became problematic as many LNG SPAs did not include provisions to determine the new price, and so it has led to the increasing use of price review mechanisms.

A «Restriction on Destination» clause is also no longer sustainable in many markets, whereby the LNG SPA should include more optimization arrangements to enhance flexibility given the expansion and diversification of LNG markets.
Recently, there has been a development of diversion clauses. Whilst the concept of a diversion clause is not new, historically there has been a focus on restrictions and profit sharing. However, there are underlying consequences which such clauses e.g. the impact on annual contract quantity, title and risk transfer point, force majeure etc. There are more intricate examples of optimization/profit sharing arrangements such as cargo swapping to reduce shipping times and costs (e.g. use US cargo to swap with European cargo coming to Asia) or to ease seasonal demand pressure), which can be incorporated in replacement of diversion clauses.

Key points:

- The downstream sector specifically focuses on preparing and providing various types of products to the end customer, whether it is through the distribution, marketing, trading or retail storage of such products.

- Given the nature of the downstream sector, including the different uses and geographies of products, there are certain regulatory issues to be considered in any transaction.

- There are many of types of gas sale agreements. These agreements cover the delivery of gas by pipeline.

- LNG Sales Purchase Agreements cover the upstream gas supply and/or liquefaction process, shipping and downstream regasification and the gas sales elements of the LNG chain.

CHAPTER 7

LOCAL CONSIDERATIONS

There are various local considerations that must be taken into account across the life of an oil and gas project, such as the interests of the government, the contractor, the lenders and the local community. The various interests and how they can be addressed are outlined in this chapter. Further, health and safety requirements and environmental considerations and regulations are also discussed.

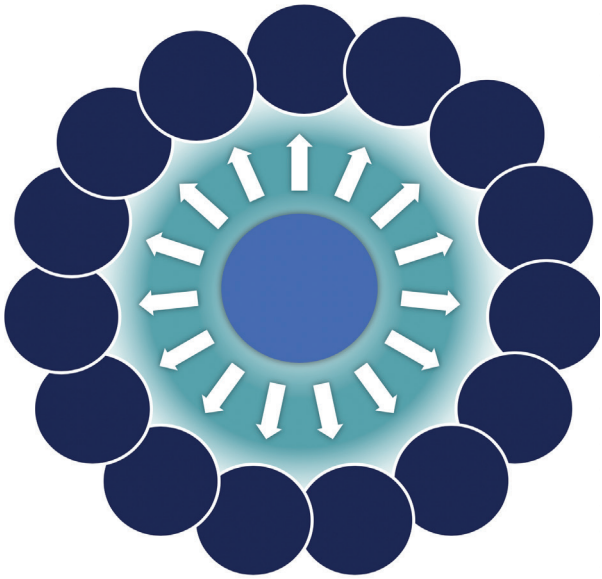
1. OVERVIEW

1.1. Project Considerations

There are various components which are inter-linked and inter-dependent across the full project value chain. All of these aspects must work together to make it a successful project. Important considerations include:

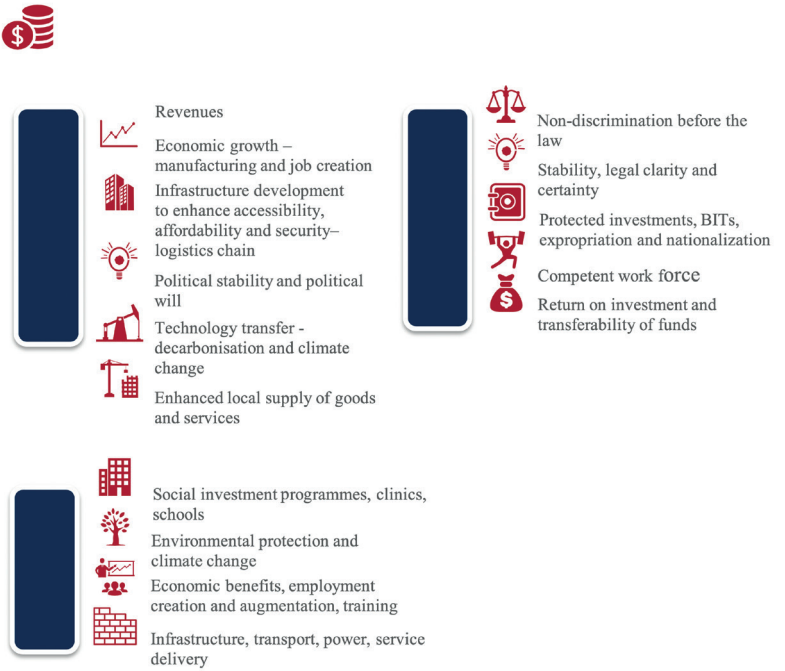
- Government support and political resolve
- strategic objectives for the sector
- macro and micro economic issues
- the proposed financing strategy and financing plan
- corporate social responsibilities and objectives

The schematic below depicts the components of the project that need to be considered.



1.2. Focal Points

The overall contracting structure needs to be assessed and managed taking cognizance of the competing interests of the various parties. Importantly, there needs to be a balance struck between the interests of the government, the contractor, the lenders and the community living within the area in which the project will be developed. These competing interests are reflected in the schematic below.



2. NATIONAL INTERESTS / REGIONAL FOCUS

Co-operation between different regional governments and national governmental organizations is important. There is a necessity of close co-operation between governments to realize the value of the oil and gas developments, which in some instances may have a cross-border perspective.

Harmonization of all the regulatory and legislative frameworks will be an important step in balancing these competing interests. An example of this includes the African Development Bank's Harmonization of Petroleum Policies, Legal, Regulatory and Institutional Frameworks in the East African Community. Harmonisation will also assist is achieving Africa's ambitions to be a stable, integrated and prosperous continent with competitive, diversified and growing economies participating fully in global trade and investment. Further, governments need to make sure that the oil and gas sectors in their

respective countries are attractive to international investors. Governments will in the same way benefit from sharing experiences and making processes more effective and efficient.

In order to ensure that contracting parties are maximizing their contribution to the national revenues, governments will need to ensure that the national resources are utilized in a sustainable manner. The challenges that exist at a governmental level include budget deficiencies or borrowing capacity (i.e. reprioritisation of budgets), existence of a poor fiscal regime, institutional capacity, political resolve, impact of conditions in the global and regional markets and trade conditions including the African Continental Free Trade Agreement, the need for specialized skills resulting from the advent of the fourth industrial revolution, governance compliance as well as the need to create and augment jobs and improve lives. Africa 2063 sets out the sustainability goals that Africa is committed to achieve.

Possible solutions to the multi-faceted challenges faced are an increased focus on the advantages of regionalization and local content requirements, where regionalization and local content requirements should be clear, concise and accessible. Local content requirements are obligations imposed by governments on international operators, which may, for example, mandate that a certain amount or ratio of nationally produced goods, or national workers or services are used.

It is also important that investors know what the local content policy (which will summarise the local content requirements) is at the start of the development of a project, so that it can be included in the development of their financial, procurement and development model. Where there are inconsistent and uncertain requirements these will present challenges. Certain jurisdictions may mandate a specific form of local content, such as in terms of priority or preference for local goods, services, consumables, works or enterprises, or may set a minimum threshold of investment in local content.

There are different mechanisms available to enhance localization objectives which should be developed, taking into account the following:

- skills development / training
- local employment requirements and targets
- technology transfer
- availability of tax and investment incentives
- the role and involvement of NOC and other state entities
- creation of special economic zones and industrial development zones

Local content requirements will have direct implications in influencing the project business model and the importance of local partners. Importantly, from an investors' perspective, correctly enforced local content requirements may be considered as a positive feature of an investment destination as they assist in combatting issues that may arise from protests of dissenting parties and other local community disruptions.

A well-structured localization programme must provide for a monitoring mechanism based on a «stick and carrot» approach, which requires a percentage of the contractors spend to be paid into a local fund that develops the community or aids the development of local industry capacity, should the contractor not achieve the specified localisation targets;

Where countries have a poor regulatory and legislative environment or a history of corruption this could result in undermining the business environment. governments and business should not adopt a «tokenistic» approach to local content development without committing to real knowledge, skills and capacity transfer. There is a need to rationalize and improve local supply and logistic supply chains, which must be founded on strong commercial relationships.

Challenges	Opportunities
Regulatory Uncertainty	Regionalisation
Labour and Community Distrust	Incentives for Investors
Arguments and Entitlement	Attract and develop the best local talent
Local industry unable to compete	Rationalise local supply chains and enhance training programmes and technology transfer
Policy Conflicts	Relationship Building between inter - ministerial departments and regulators
Tokenistic Approach	Speed and Efficiency

2.1. Job creation

Job creation is often a pre-requisite under local content, such as through the procurement of goods and services. There may be a need for training which in return requires investment in order to address the skills gap. The objective of local content requirements must be to ensure the achievement of a situation that even if the oil or gas runs out, the skills developed in the local community will remain. Job creation and job augmentation are critical strategies.

2.2. Rise of local content requirements in Africa (Examples)

Government	Recent Local Content Developments
Nigeria	Nigerian Oil and Gas Industry Content Development Act 2010
Uganda	Petroleum (Exploration, Development and Production) Act 2013
Ghana	The Petroleum (Local Content and Local Participation) Regulation 2013
Mozambique	Finalizing gas master plan
Tanzania	Finalizing gas master plan
South Africa	Black Economic Empowerment / Preferential Procurement Policy Framework Act / Mining Charter / Renewable Energy Independent Power Producer Procurement Programme

3. HEALTH AND SAFETY

Health and Safety has been receiving amplified attention due the emergence of a stronger labour movement and advent of consumerism. People are more conscious that the oil and gas industry involves high-risk activities such as the exploration process and the use of flammable and explosive materials. The industry makes use of heavy and complicated machinery that requires an extensive and carefully constructed health and safety system. Oil and gas projects often involve working in a remote and harsh environment where there is a heightened need to guard against casualties, pollution, lost investment and reputational damage.

According to member companies' safety reports compiled by the International Association of Oil and Gas Producers, the African region reported the second largest number of fatalities in 2014 and 2015, after the North America region, as illustrated in the table below.

Region	Fatalities		Fatal Accident Rate[28]		Fatal incidents	
	2015	2014	2015	2014	2015	2014
Africa	10	5	1.84	0.86	7	5
Asia and the Pacific	7	11	0.76	1.02	4	10
Europe	4	4	1.17	1.04	4	4
Former Soviet Union	4	2	1.60	0.81	3	2
Middle East	7	2	1.07	0.33	7	2
North America	20	16	2.31	1.56	13	14
South and Central America	2	5	1.41	1.13	2	5
Overall	54	45	1.45	1.03	40	42
Source: IOGP, 2016[29]						

4. ENVIRONMENTAL ISSUES

An EIA is performed by the contractor and sets out certain required environmental information that is then provided to the applicable regulatory authority. One of the aims of an EIA is to identify any potential environmental impacts that may arise as a result of the proposed project. Consultation plays a major role in the gathering of this information with the objective of mitigation, management and monitoring of the consequences on the environment of the project.

Consultation with surrounding communities and people inhabiting the area plays a major role in the gathering of this information.

Liability for environmental incidents will vary on a jurisdiction-by-jurisdiction, but may involve strict liability per incident and may involve a combination of both civil liability (resulting in a fine) and criminal liability (dependent on the severity of the incident) for the contractor. It is recommended that an environmental consultant, with a strong track record in the oil and gas sector, be appointed to conduct the EIA. The consultant will gather environmental and socio-economic baseline data from as many sources as possible, including from government agencies, NGOs and research organizations where applicable. Certain technical studies should

[28] The Fatal Accident Rate is the estimated number of fatalities per 100 million hours, which is roughly 1000 employee working lifetimes.
[29] https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/meetingdocument/wcms_554798.pdf

be conducted in respect of water discharge, drill cuttings and oil spill modelling as well as the development of a waste management plan. An important part of the EIA is to work with regulators to ensure that the project meets the specific requirements of national legislation.

Adherence to compliance with all environmental laws and standards will be a prerequisite for a project to source any required debt financing.

As the industry has developed and grown, it is not surprising so has the need for its regulation. The following are noteworthy regulatory developments to be complied with in this regard:

- UN Sustainable Development Goals and Africa Agenda 2063

UN Sustainable Development Goals and Agenda 2063

The UN Sustainable Development Goals and the Agenda 2063 provide for *inter alia* affordable and clean energy.

Set out below please find schematics reflecting the UN Sustainable Development Goals and Africa 2063.

Africa 2063

- Lenders are required to invest in projects that are in compliance with the Equator Principles and World Bank Standards
- National government commitments under the Kyoto Protocol and Paris Agreement
- Environmental standards for the conduct of hydraulic fracturing including:
  - well abandonment
  - drilling fluid
  - management of waste
  - management of water
- Early warning monitoring and response systems in respect of possible failures, blowouts, spills and contamination.

4.1. Decommissioning

Decommission involves the process of dismantling, removing and the disposal of the field property at the end of field life. Decommissioning begins with the planning, cleaning, preparation for removal and plugging the wells. In the event of a «mothballing» period, there will be a significant interest in the costs incurred.

Floating installations will be cleaned and towed away, or in the case of a fixed installation, the installation will be cut up and removed by barge. It may be possible to re-use some installations. The pipelines with be either pigged, flushed, filled and plugged then removed or left in situ. This process used to be known as «abandonment» because many rigs were «abandoned» to become artificial reefs. Due to environmental concerns there was a move from abandonment to decommissioning.

Key points:

- In all oil and gas projects, there must be a balance between the interests of government, the contractor, the lenders and the local community.
- Co-operation between different regional governments and national governmental organizations is important, as is the harmonization of all the regulatory and legislative frameworks.
- There should be an increased focus on local content requirements, and investors should know what the local content policies are at the start of a project.
- Job creation is often a pre-requisite under local content, such as through the procurement of goods and services. There may be a need for training.

- The oil and gas industry involves high-risk activities, which makes health and safety considerations essential.

- The aim of an EIA is to identify any potential environmental impacts of a project and how they will be resolved.

- There various environmental regulations that oil and gas companies must comply with.

CHAPTER 8

INTRODUCTION TO DISPUTE RESOLUTION IN THE OIL AND GAS INDUSTRY

This chapter outlines the dispute resolution clauses in an oil and gas contract and the various dispute mechanisms available to parties. It details the options and processes for arbitration proceedings and explains litigation financing options. The chapter ends with a description of bilateral investment treaties.

1. OIL AND GAS DISPUTES

As in any industry, disputes in the oil and gas industry do frequently occur. Due to the broad nature of the type of contracts oil and gas companies enter into and the various different ways any particular project might be structured, all different manner of disputes might arise. However, common themes include:

- Joint Venture disputes
- Disputes around resource nationalism
- Disputes around validity or illegality
- Pricing disputes
- Disputes relating to local content regulations
- Bilateral Investment Treaty claims

The disputes that generally arise in the oil and gas industry in Africa are those with government bodies. Disputes amongst the various oil companies and producers do occur but not as regularly, as they are mitigated by the companies working with each other in numerous jurisdictions and the need to maintain a good working relationship with each other and their own reputation.

1.1. Joint Venture disputes

Oil and gas projects and/or oil and gas companies are perhaps more likely than other industries to consist of some form of joint venture between different oil and gas companies or between a state entity and a private oil and gas company. There are various reasons for this. The costs and risks of projects may require a company to seek a joint venture (JV) partner to share these costs and risks. The project may require a specialist skill that requires the oil and gas company to team up with a specialist company. The country in question may have a dominant local entity with local resources and knowledge, which it would be sensible to utilise. The relevant country may have legislation that requires a minimum level of local ownership. The government of the relevant country may insist on being part of any project as a condition of the grant of any exploration or exploitation license.

Regardless of the reasons for the JV structure, whenever there is a project or company that is being operated as a JV there is a real risk that, at some stage, a dispute will arise between JV partners. This could stem from a dispute regarding; the strategic direction

of the company/project; investment decisions and/or the need to commit finance; how costs are allocated or charged between the parties; or the performance by one party of any obligations specifically assigned to that partner. Where a state is one of the JV partners, often a change in government can lead to the re-evaluation of a JV project and a desire by the new government to change existing arrangements or JV partners.

Often such disputes are resolved internally through discussions, negotiations or amendments to the JV arrangements, to the mutual satisfaction of the JV partners. Occasionally, however, they will need to be determined by a third party. Often once a dispute is resolved (especially disputes of a technical nature), parties can continue with the JV relationship, but occasionally the relationship irreparably breaks down requiring the project or company to be wound down or one party to exit the arrangement.

1.2. Disputes around resource nationalism

Countries in Africa, like all nations, are increasingly mindful of their natural resources and the need for such resources to be exploited for the good of the country. Likewise, there is an increasing shift towards the state itself being increasingly involved in how such resources should be exploited and sharing more meaningfully in the venture. Similarly, the greater experience and sophistication of state-owned African energy companies means that states have greater confidence in exploiting their own natural resources without the involvement of foreign companies.

Such increased nationalism around resources has led to disputes in the oil and gas sector as states seek to exercise greater control over its resources. The risk is increased where there might be changes in government with different attitudes towards resource nationalism. This can include disputes regarding the cancellation of concessions, either with the aim of or the consequence that, the concession is taken over by a state entity. It can also include disputes as to the extent of the state's involvement in any production sharing agreement.

In one recent example, an African state's desire to exercise further nationalism over its natural resources extended to seeking to impose control over the method for resolving any disputes in the oil and gas sector. In 2017, Tanzania passed the Natural Wealth and Resources (Permanent Sovereignty) Act 2017 and the Natural Wealth and Resources Contracts (Review and Re-negotiation of Unconscionable Terms) Act 2017. The effect of these Acts was to attempt to require all disputes relating to Tanzania's natural resources to be determined by local Tanzanian courts (and not arbitration) and to render any existing dispute resolution clause inconsistent with this requirement void as a matter of Tanzanian law.

1.3. Disputes around validity or illegality

Disputes often arise in the oil and gas sector relating to the validity of a contract or concession entered into by a state entity. Again, such disputes often arise following a change of government. The disputes may include allegations that certain conditions precedent or performance benchmarks have not been met, enabling the state to terminate the contract.

In other cases, the disputes centre on the question of authority and an allegation that the minister or government department in question did not have the authority or necessary approvals required to enter into a binding concessions agreement or production sharing agreement.

Occasionally, the government will allege that the relevant contract was entered into and procured by bribes by the contractual counterparty and, as a consequence, the contract is void. A well-documented example of this occurred in Djibouti where the government unsuccessfully attempted to seek the cancellation of a long-term concession agreement for the operation of Djibouti's port facilities on the basis that a key government employee tasked with negotiating the concession agreement deliberately negotiated terms favourable to the operator and unfavourable to the state in return for a bribe.

1.4. Price related disputes

Due to the way many oil and gas contracts are structured, including concession agreements and production sharing agreements, pricing is often the cause of disputes. This might relate to the costs involved in, and therefore resulting profitability of, certain projects where the state is remunerated by reference to such profitability. Technical disputes can also arise where payments or charges are calculated by complex mathematical formulas where there might be a difference in the interpretation of the formula or the accuracy of the information used in the equation.

Disputes can also arise from fluctuations in the price of oil and gas generally and from the resulting divergence this can cause in the commercial aims of private energy companies and oil and gas companies. Where there is a price downturn, a private energy company is likely to want to scale back its exploration and production operations with a view to saving costs until the price recovers. The state, on the other hand, will want production to continue, if not increase, to try to minimise the impact of reduced revenue.

1.5. Disputes relating to local content regulations

As mentioned above, many African governments are increasingly looking at ways in which their respective countries can benefit more widely from the exploitation of their natural resources. One such option is by requiring, either through legislation or through the conditions of any tender that local goods and services are used to a certain minimum level such that the project and the wider supply chain benefit the local or national community to a greater degree. This can lead to disputes where there is disagreement as to whether compliance with such local content requirements has been fulfilled or where such requirements are introduced after the contractual documentation has been finalised.

1.6. Bilateral Investment Treaty claims

As oil and gas contracts often involve a state party and/or is dependent on the cooperation (or at least non-interference) of the state, often disputes between an oil and gas company and a state can involve potential breaches of rights and the right to bring a claim under a Bilateral Investment Treaty. This is discussed in more detail below.

2. PRE-DISPUTE STAGE: NEGOTIATING THE DISPUTE RESOLUTION CLAUSE

2.1. Introduction

Critical to the management of any risk that might arise out of the oil and gas transaction is an appropriate dispute resolution mechanism to resolve any potential disputes. A carefully drafted contract needs to be capable of being enforced through a high-standard, quick and impartial dispute resolution mechanism resulting in a fair determination of any dispute, which can then be effectively enforced against the losing party.

2.2. Dispute mechanisms

The Association of International Petroleum Negotiators (AIPN) recommends the use of several alternative approaches to disputes clauses in oil and gas contracts. Alternative approaches could include the following:

- Negotiation by senior executives
- Expert determination
- Court process
- Arbitration

If arbitration is used, the following institutional rules may be chosen to regulate the arbitration:

- American Arbitration Association (AAA)
- International Chamber of Commerce (ICC)
- The London Court of International Arbitration (LCIA)
- Singapore International Arbitration Centre (SIAC)
- United Nations Commission on International Trade Law Rules (UNCITRAL) If expert determination is used, the ruling of the expert will in most cases be final and binding on the parties.

2.3. Court proceedings

The use of the national courts as the forum for dispute resolution is often preferred by NOCs, given that it provides a «home field advantage».

The advantages of using the national courts include the publicity of the dispute and the forum, the ability to appeal the judgment, the availability of a summary process, certainty of the process and the ability to join third parties to the dispute.

One disadvantage that may arise is that the judge hearing the dispute may lack the necessary expertise in the oil and gas industry, necessary to adjudicate the dispute. In a court process there may be fixed time periods that need to be adhered to.

2.4. Arbitration

From a contractor perspective, arbitration provides a more neutral forum than national courts.

Some of the other advantages afforded by arbitration proceedings include that the proceedings are confidential, and the dispute is adjudicated by an expert arbitrator.

Some of the disadvantages include that there is usually no summary procedure and it is difficult to join third parties to the dispute or to consolidate disputes.

In an oil and gas context, where confidentiality and timing might be more important than in other transactions, arbitrations provide a better dispute mechanism.

2.5. Enforcement of an arbitration award

A total of 156 of the 193 United Nations member states are signatories to the New York Convention[30] . In terms of Article III: «Each Contracting Government shall recognize arbitral awards as binding and enforce them in accordance with the rules of procedure of the territory where the award is relied upon….»

Set out below is a schematic of countries who are signatories to the New York Convention. More than thirty signatories are African.

2.6. Arbitral tribunal vs. sole arbitrator

The benefits of a arbitral tribunal adjudicating the dispute is that it allows for the appointment of arbitrators from various fields of expertise and legal backgrounds as well as for the process of deliberation

[30] hhttp://newyorkconvention1958.org/index.php?lvl=cmspage&pageid=4&menu=671&opac_view=-1

The appointment of multiple arbitrators may however create time delays and increased costs, whereas a sole arbitrator hearing will likely result in more time and cost efficiencies.

2.7. Arbitration clauses

When drafting arbitration clauses into agreements the following elements should be catered for:

- Arbitral rules, whether institutional or ad hoc;
- Seat (legal place) of the arbitration;
- Law governing the arbitration;
- Provision for the number of arbitrators to be appointed to the tribunal;
- the language of the arbitration;
- the nature of the decision - final or subject to appeal.

2.8. Frequent problems with arbitration clauses

Generally, the following issues arise in contracts that contain arbitration clauses:

- Conflicting clauses – separately referring to both arbitration and litigation
- Not specifically referring to arbitration (e.g. resolved by a neutral)
- Not specifying the seat of the arbitration
- Referring to a non-existent institution
- Trying to cover too much – institutional rules are tried and tested

2.9. Key recommendations

As an accurate and specific dispute resolution clause may be considered one of the most important clauses in a contract, it is important to agree the forum in principle as early as possible.

It is important to remember that enforcement, confidentiality and a neutral venue are key components in parties agreeing to arbitrate as opposed to litigate.

As a rule it is recommended that asymmetrical or optional arbitration clauses which give one party the right to elect arbitration should be avoided.

In all circumstances provision should be made for a party to approach a Court of competent jurisdiction to obtain interim or urgent relief.
Care must be taken in assessing whether or not a dispute mechanism should be designated as a sole and exclusive remedy.

3. THE ARBITRATION PROCESS

3.1. Initial considerations

Three initial considerations should be considered: (i) the seat of the arbitration hearing; (ii) the choice of arbitrator; and (iii) the initial procedural order. The seat of the arbitration is normally held in the nation of the law that governs the procedure of the arbitration and should be stated in the agreement.

In respect of the initial procedural rules, common factors that need to be considered include timing, consolidation or joinder, expert evidence and allowed disclosures.

3.2. Key steps during the proceedings

Firstly a request or notice for an arbitration (or equivalent document, depending on which rules are applied) is submitted by one of the parties. If both parties agree to arbitration, there may be scope for a new arbitration agreement to be entered into which will govern the arbitration. Otherwise, the provisions in the underlying agreement will apply.

The next step involves the appointment of the arbitral tribunal or sole arbitrator, which will depend on the provisions specified in the arbitration agreement, the procedure set out in any applicable arbitral rules or ad -hoc procedures, and the agreed number of arbitrators. A preliminary meeting is required under the ICC Rules, but in most arbitrations this preliminary meeting will be held regardless of whether the rules require it or not. It is at this preliminary meeting where the parties will agree a timetable for the proceedings.

Once the tribunal has been appointed and the timetable agreed, the parties will make their submissions (statements of case, memorials, submissions, pleadings).

During the substantive hearing, the evidence that may be led in arbitration proceedings are documentary, witness and expert evidence. Thereafter the parties may submit written submissions in reply to any counter-arguments or justifications.

Following the substantive hearing the parties are afforded the opportunity to make final written submissions to the tribunal, after such time the tribunal will declare the proceedings closed and commence with the preparation of the award. Once the tribunal has reached a decision it will publish its award which will either be remitted to the parties directly or to the institution.

4. LITIGATION FINANCING

Litigation funding is often referred to as third party funding. It provides a company that does not have the financial resources to pursue litigation and realize the full value of its potential claims or defence by providing the resources to hire the appropriate counsel and to bring a case to its finalisation.

There are significant number of parties in the market offering this service, although some more reputable than others. There is usually about a six-month due diligence process before the funding is granted, with the following criteria been considered as key from the financiers:

- opponent with sufficient financial standing;
- there are good enforcement prospects;
- the claim has strong legal merits;
- sufficient sum at stake – greater of 3-4 times investment or 10-30% of any recovery and confidence in legal counsel.

4.1. Trend of disputes

The disputes that generally arise in the oil and gas industry are those with government bodies. Disputes amongst the various oil companies and producers do not regularly occur, as they are mitigated by the companies working with each other in numerous jurisdictions and the need to maintain a good working relationship with each other and their own reputation.

5. INVESTMENT TREATY PROTECTIONS

A «BIT» is a bilateral investment treaty concluded between two countries in order to provide protection for any investments made by investors from one contracting state in the jurisdiction of the other contracting government. The objective of BITs is to encourage foreign investment by mitigating political risk and offering comfort that any dispute resolution process will be governed on a neutral basis (usually through arbitrations).

BITs provide important rights for overseas investors. As claims in the industry are multiplying, it is advisable that any overseas investment be structured to ensure BIT protections (in parallel with tax). In recent years, the oil and gas companies have been relying on international investor-state arbitrations as a means to resolve high-profile and high-value disputes with foreign governments.

Generally, a company can initiate investor-state arbitration if the company is a company from one of the countries that signed the relevant BIT or it invests in another state that signed the same agreement.

Where a company or person makes an investment into a host country and if the investor is a national of a country that has entered into a BIT with the host country then the host country needs to carry the responsibility for any harm as a result of this investment. The investor and the host government do not need to conclude an agreement with each other as a prerequisite, as the rights afforded under a BIT arise as a result of public international law.
The nationality of the investor will be easy to determine in circumstances where the person or company only has connections to one jurisdiction. It becomes more complicated when dealing with multi-national corporations.

5.1. Protections

Protections commonly included relate to:

- ***Fair and equitable treatment***

  This is a broad standard but is generally accepted to protect the investor against anything that is arbitrary, discriminatory, or contrary to an investor's expectations.

- ***Protection against expropriation***

  Aims to limit the foreign government's power to expropriate (i.e., seize or take possession of) foreign investments or at least impose market friendly compensation terms.

- ***Full protection and security***

  Generally, the obligation placed on the government will be to exercise due diligence in providing «full protection and security» to foreign investments.

- ***Repatriation of returns***

- ***Most favoured nations treatment***

- ***Dispute resolution***

5.2. Conclusion

It is important to always bear in mind that the conclusion of a BIT is relevant and applicable to all international «investments», but it serves as a mitigation mechanism to risk and not a magical cure.

The ability to threaten a BIT claim does provide a party with considerable advantage, as the International Centre for Settlement of Investment Disputes arbitrations are public and linked to the World Bank.

Key points:

- An appropriate dispute resolution mechanism is critical to the management of transaction risks.

- The Association of International Petroleum Negotiators recommends the use of several alternative approaches to disputes clauses in oil and gas contracts including negotiation, expert determination, court process and arbitration.

• The advantages of arbitration proceeding are that they can provide a more neutral forum than national courts, they are confidential, and the dispute is adjudicated by an expert arbitrator.

• The disadvantages of arbitration include that there is usually no summary procedure and it is difficult to join third parties to the dispute, and to consolidate disputes.

• Litigation funding is third party funding that provides a company with the financial resources to hire the appropriate counsel and to bring a litigation case to its finalisation.

• A bilateral investment treaty is concluded between two countries in order to provide protection for any investments made by investors from one contracting state in the jurisdiction of the other contracting government.

GLOSSARY

AAA	American Arbitration Association
Abandon	The process of ceasing work on a non-productive well, plugging it, and salvaging all recoverable equipment.
Annex B	An operator's development plan for an offshore installation.
AIPN	Association of International Petroleum Negotiators.
API Gravity	American Petroleum Institute gravity, a way to measure the weight of petroleum liquid in comparison to the weight of water.
Appraisal Well	A well drilled as part of an appraisal programme to investigate the extent, reserves, and production of an oil well.
Associated Gas	The natural gas produced with crude oil from the same reservoir.
Back-in Right	A feature of oil and gas contracts that allows a party (often governments) to acquire equity participation if a commercial discovery is made.
Barrel	One barrel of oil - the key unit of measurement for petroleum and its products.
bbl	One barrel of oil - ar ound 35 Imperial gallons, or 159 litres. 7.5 barrels is around one tonne.
bcf	Billion cubic feet - 1 bcf = 0.83 million tonnes of oil equivalent.
bcm	Billion cubic metres - 1 bcm = 35.21bcf.
Benchmark crude	Oils against which other oils are priced (at a discount or premium depending on their grade) - the three primary benchmarks are Brent Crude, West Texas Intermediate, and Dubai Crude.
BIT	A bilateral investment treaty, concluded between two countries in order to provide protection for any investments made by investors from one contracting state in the jurisdiction of the other contracting government.
Blending	A process of producing a specific mix of oil (usually to try and meet fluctuating market demands).
Block	A method used to designate an area of land (or ocean), which is divided into areas which companies or consortia bid to work on.

Blowout	The sudden and uncontrolled release of oil or gas from a well when pressure control systems fail.
BoL	Bill of lading, a document issued by an oil carrier, which details a shipment of merchandise and gives title of that shipment to a specified party.
Booking	The process by which reserves are added to the balance sheet of an oil company - often subject to strict regulations as to how booking is carried out.
Bunkering	The illegal removal or theft of oil from a pipeline or other distribution system.
Capex	Capital Expenditure
Christmas Tree	The assembly of fittings and valves on top of the casing (extraction pipe) that control the rate of production.
Coal Bed Methane	Natural gas found in coal beds during underground mining operations.
Commerciality	A term widely used to describe the extent to which a particular oil or gas field has sufficient reserves to justify further investment.
Concession	A lease agreement where an oil company enjoys the exclusive right to produce oil in a given area.
Condensate	Liquids (such as ethane, butane, or pentane) which are present in natural gas when extracted. These are usually separated for separate sale.
Cracking	A second stage refining process which involves breaking down long-chain hydrocarbons (such as tar and bitumen) into more in-demand products, such as gasoline or diesel oil.
Depletion	The decline in production that begins to appear in oil reservoirs as resources become exhausted. Globally, depletion is estimated at around 3 to 5 percent per year.
Development Well	A well drilled at a producing oil field, aimed at maximising production.
Downstream	The series of operations taking place after the oil has been discovered and produced from the wellhead.

E&P	Exploration and Production - the 'Upstream' sector of the oil and gas industry.
EEZ	Exclusive Economic Zone, areas beyond and adjacent a nation's territorial sea, where that nation has the right to explore, exploit, conserve and management the natural resources in that area.
EIA	Environmental impact assessment.
Elephant Field	A field with reserves exceeding 1 billion barrels.
Environmental Impact Assessments	These are carried out by companies beginning a project to identify any possible environmental, social, or economic impacts, and any measures needed to mitigate them.
Farmout Agreement	The sale of rights to a discovery once oil has been struck - also known as 'farm down' agreements.
FLNG	Floating liquefied natural gas unit.
FOB	A free on board contract, a contract under which a seller provides crude oil, oil product or LNG at a lifting installation, where all loading costs to put the commodity on board have been paid.
FPSO	Floating production, storage, and offloading vessel.
FSO	Floating storage and offloading unit.
FSRU	Floating storage and regasification unit
Fracking	The process of shooting water, sand, and other compounds at rock structure so as to produce fracture through which oil can be extracted.
GSA	Gas Sales Agreement.
Horizontal Drilling	A type of directional drilling which allows drillers to access pockets of reserves that are harder to reach with a vertical well.
ICC	International Chamber of Commerce.
ICE	Intercontinental Exchange, a crude oil futures market.
IFV	Intermediate Fluid Vaporisers.
Integrated Energy Company	A company which is active in all stages of the value chain - from exploration through production to shipping, refining and marketing.

International Oil Company (IOC)	A private, multinational oil producer - for example, BP, Shell, or Chevron.
JOA	Joint Operating Agreement.
LCIA	The London Court of International Arbitration.
Licensing Round	An event at which oil and gas acreage is opened up by a government to competing bids.
Lifting Costs	The cost of producing oil from a well or lease.
Liquefaction	The process of converting gas to liquid for ease of storage and transport.
LNG	Liquefied natural gas.
LNG SPA	A sale and purchase agreement for liquefied natural gas.
LPG	Liquefied petroleum gas, such as propane and butane.
MARPOL	The International Convention for the Prevention of Pollution from Ships.
mtoe	Million tonnes of oil equivalent.
National Oil Company (NOC)	A state-owned exploration and production company, usually used in contrast with IOCs - for example, Sonatrach, Petronas, or Petrobras.
NCI	Nelson Complexity Index, a pure cost index used to measure the complexity of a refinery, relative to other refineries.
Non-Associated Gas	Gas found in reservoirs without any (or a significant amount of) oil.
NYMEX	New York Mercantile Exchange, a crude oil futures market.
Offshore	The entire industry of drilling wells into the seabed.
Oil Sands	A different source of oil - a mixture of sand, water, and bitumen - which is essentially mined.
OPEC	Organization of the Petroleum Exporting Countries
Opex	Operational expenditure, the expenditure necessary to keep a business running on a day-to-day basis.

Operator	The company with legal authority to drill wells and produce hydrocarbons - often part of and acting on behalf of a consortium.
OPRC	Convention on Oil Pollution Preparedness, Response and Cooperation.
PA	Participation Agreement.
Petrodollar	The funds received from oil sales (as sales are usually made in USD).
Pipeline	A pipe, usually underground but sometimes undersea, which is used to transfer oil and gas over long distances.
Plateau Production	The policy aim of keeping production out of a mature oilfield steady for a number of years.
Possible Reserves	Reserves which are estimated to have a good, but not 50%, chance of being producible.
Pre-Salt	Refers to types of deposit found below thick layers of salt which have only recently become exploitable.
Probable Reserves	Reserves with a greater than 50% chance of being producible.
Production Sharing Contract	An agreement between a company and a host state setting out the percentage of oil each party will receive after costs and expenses have been paid. Usually, the state receives its share in the form of cash payments.
Profit Oil	The portion of revenues which is divided between participating parties and the host government in a PSA.
Proven Reserves	Reserves which have been found to be virtually certain to be producible (usually a more than 90% chance).
PSAs	Production Sharing Agreements.
Recovery Rate	The percentage of an overall oil field that will be extracted compared to the amount of oil in place.
Refining	The processes which convert crude oil and gas into usable products.
Reserves-Production Ratio	The number of years a state can continue producing at a given rate given the level of its proven reserves.
Resource Curse	The theory that natural wealth can paradoxically create negative development outcomes in producing countries as a result of weakened institutions, neglect of other key sectors of the economy, corruption, and so on. Also called the «Paradox of Plenty».

Royalties	A percentage share of production, or the value of the production which goes to the government regardless of the rate of production or costs.
SCV	Submerged Combustion Vaporisers.
SEC	United States Securities Exchange Commission.
Seismic Survey	Technology similar to ultrasound which is used to build a picture of underground rock structures during early stage exploration.
Service Company	An oil company that manages operations in both the upstream and downstream but does not itself engage in production of oil - for example, Schlumberger or Halliburton.
SIAC	Singapore International Arbitration Centre.
Subsoil Rights	Who owns resources under the ground - in the USA, this is the landowner, whereas in most of the rest of the world it is the
Swing Producer	A state which has production capacity significantly above its actual production levels, allowing it to raise production overnight and hence influence oil prices. Historically this was Saudi Arabia, but other countries - such as the USA - are now beginning to fill a similar role.
UNICITRAL	United Nations Commission on International Trade Law Rules.
UNCLOS	UN Convention on the Law of the Sea.
Unconventional Energy Sources	Any oil or gas accessed except by the conventional oil well method. An umbrella term that incorporates (for example) oil sands and shale gas.
Upstream	The capital-intensive, high risk initial stages of the industry, involving exploration, development, and production.

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