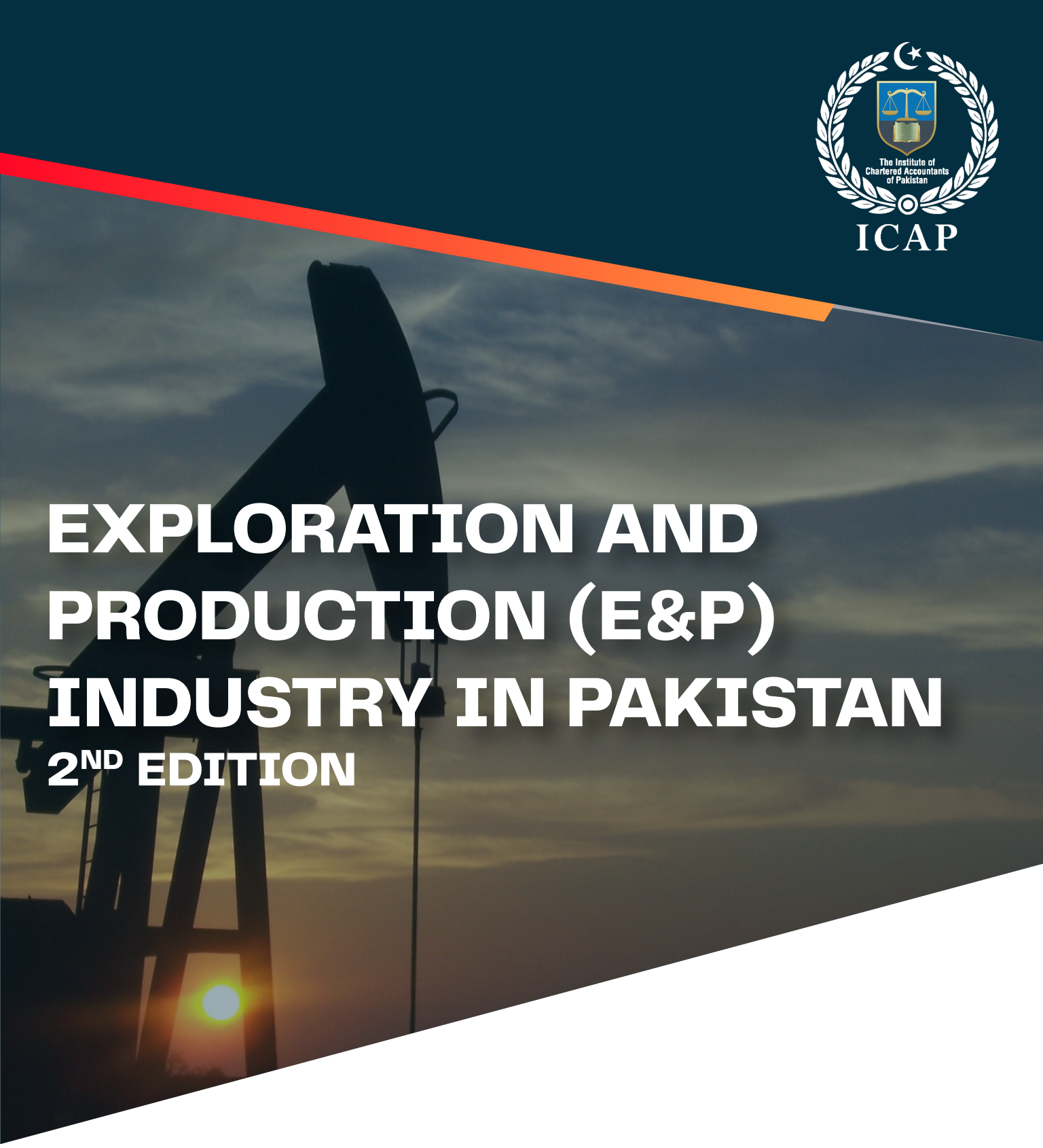

EXPLORATION AND PRODUCTION (E&P) INDUSTRY IN PAKISTAN

2ND EDITION

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01 EXPLORATION AND PRODUCTION (E&P) INDUSTRY IN PAKISTAN

Introduction

The oil and gas industry may be categorized into three major sectors, namely upstream, mid-stream, and downstream. The upstream sector, also known as the exploration and production (E&P) sector, is associated with exploring and producing hydrocarbons (crude oil, natural gas, and LPG). The mid-stream sector involves processing this crude oil and natural gas by oil refineries, gas processing plants and fertilizer plants into end-user products e.g. motor spirit, diesel and jet fuel etc. A large part of the mid-stream sector also includes transportation and storage of crude oil and natural gas. The downstream sector includes marketing and distribution of these end-user products, including refined oil and gas to industrial, commercial and residential consumers such as power plants, petrol pumps, various industries and households.

Background

Pakistan remains a promising frontier for hydrocarbon exploration and development. Pakistan's petroleum sector has evolved through distinct phases: colonial exploration, post-independence restructuring, state-led initiatives, and private-sector revival. Each era contributed to the foundational infrastructure and knowledge base that supports the country's current energy landscape.

The early phases of exploration in the subcontinent drew attention in 1866 by the signs of natural hydrocarbon presence shown during surface seep surveys-conducted to investigate the natural oil seepages in Kundal, Mianwali areas (Pakistan). In subcontinent Makum was the one to be later on observed with oil seepage and drew interest in exploration leading to first mechanically drilled oil well with commercial discovery in Digboi, Assam in 1889.

The first discovery of oil was made in Khattan (Balochistan) with thirteen wells producing a total of 25,000 barrels from 1885 to 1892. However, the first commercial success came with the drilling of Khaur-1 well by the Attock Oil Company in 1915. Oil discoveries continued with the drilling of around 396 shallow wells at Khaur from 1915 to 1954.

After gaining independence, Pakistan's first natural gas field, Sui, was discovered in 1952 and commercial production began in 1955, which changed the whole scenario for Pakistan's energy supply. Post independence, Pakistan's first oil field, Toot, was discovered in 1964 and its commercial production began in 1967. Later on, local companies namely OGDCL, PPL, POL, Mari Energies and several international companies including Esso, Union Texas, Occidental, OMV, BHP, Lasmo, ENI, BP, Petronas, POGC , MOL, OPI , PEL, and UEP have made major oil and gas discoveries in the provinces of Punjab, Sindh, and KPK .

It is important to mention that all of the above successes were made in on-shore areas and so far there has been no commercial success in the off-shore areas of Pakistan. Further, the Balochistan province remains largely unexplored and the country needs an urgent focus to improve security and other relevant conditions in the province to increase E&P activities there.

Major Players in Pakistan

The following are the major upstream/E&P sector players in Pakistan:

Company	Local /Foreign
Dewan Petroleum Limited	Local
Mari Petroleum Company Limited	Local
MOL Pakistan	Foreign
Oil & Gas Development Company Limited	Local
Orient Petroleum Inc	Foreign
Pakistan Oilfields Limited	Local
Pakistan Petroleum Limited	Local
Petroleum Exploration Limited	Local
Polish Oil and Gas Company (PGNiG)	Foreign
Prime International Oil and Gas Company Limited (Formerly ENI Pakistan)	Foreign
United Energy Pakistan Limited	Foreign

Main Petroleum Products

Crude Oil

Crude oil, also known as petroleum, is a naturally occurring fossil fuel found underground. It is a complex mixture of hydrocarbons, which are organic compounds made up of hydrogen and carbon atoms. Crude oil is the primary raw material for the production of various petroleum products, including gasoline, diesel, jet fuel, and petrochemicals. It is typically extracted from oil reservoirs through drilling and then refined at petroleum refineries to obtain usable products.

Natural Gas

It is a naturally occurring hydrocarbon gas mixture that is primarily composed of methane (CH4) usually from 70% to 95% with smaller amounts of other gases, such as ethane, propane, and butane. It is a clean-burning fuel used for various purposes, including heating, electricity generation, and as a fuel for vehicles. Natural gas is often found in underground reservoirs and is extracted through drilling.

Liquefied Petroleum Gas (LPG)

LPG is a mixture of propane (C3H8) and butane (C4H10) gases that are typically produced as byproducts of natural gas processing and crude oil refining. LPG is stored and transported in a liquefied state under pressure. It is commonly used as a fuel for heating, cooking, and as an alternative vehicle fuel. LPG is known for its convenience, as it can be easily transported and stored in containers.

Liquified Natural Gas (LNG)

LNG is natural gas that has been cooled to extremely low temperatures (around -260°F or -162°C) to convert it into a liquid form for easier transportation and storage. It takes up significantly less space in its liquefied state, making it more feasible to transport natural gas over long distances, often via ships. LNG is regasified upon arrival at its destination and can be used for various purposes, including power generation and heating.

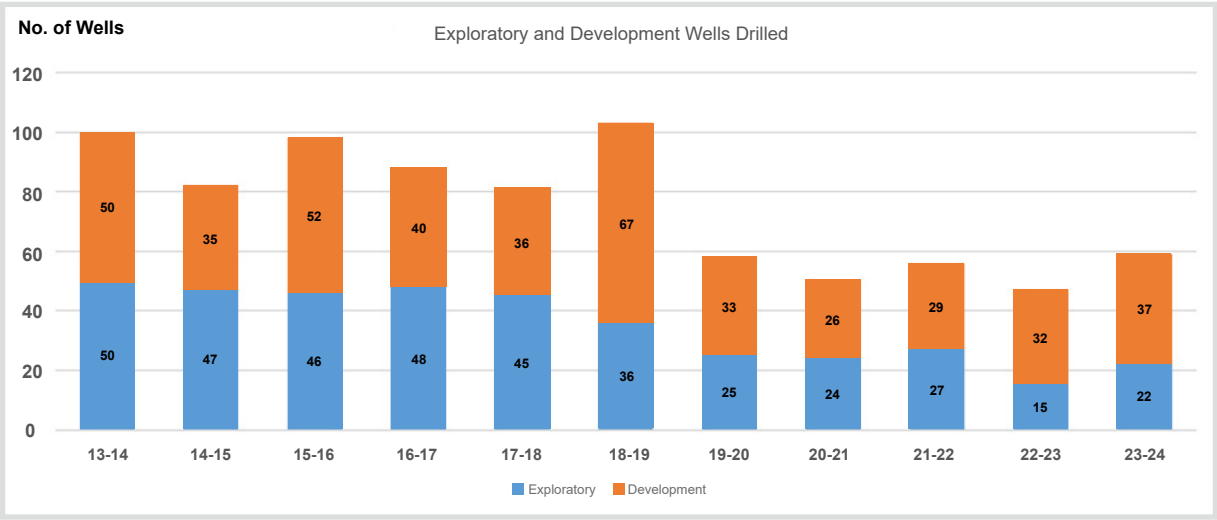
Solvent Oil

Solvent oil is a broad term that refers to various petroleum-based solvents used in industrial, commercial, and household applications. These solvents are typically derived from crude oil and are used for tasks such as cleaning, degreasing, and dissolving substances. They can vary in composition and properties, depending on the specific application, and can include products like mineral spirits, kerosene, and naphtha.

Sulphur

Sulphur is a chemical element found in nature and is a common component of crude oil and natural gas. It is removed from these hydrocarbon sources during the refining process to prevent environmental pollution and corrosion issues. The extracted sulphur is then used in various industrial applications, including the production of sulphuric acid and fertilizers.

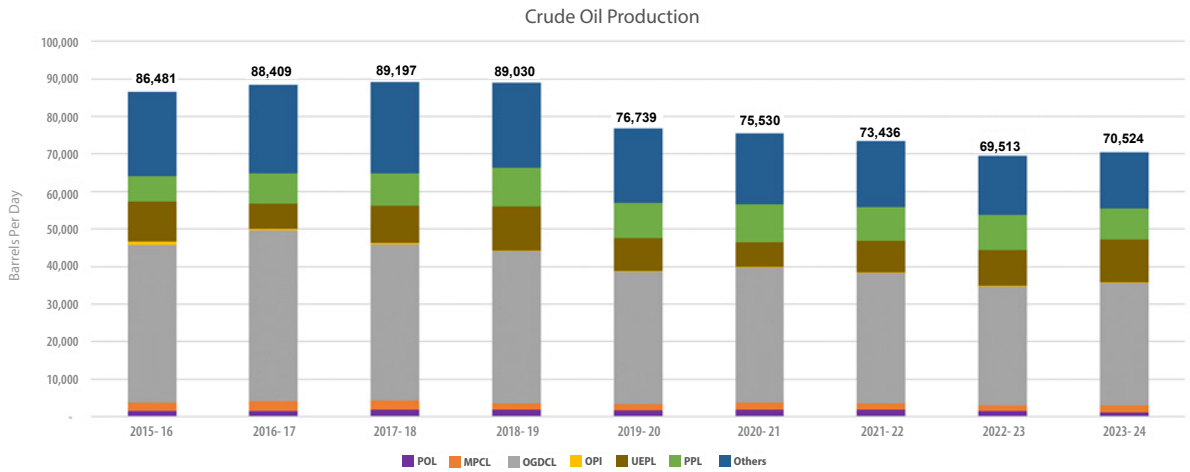
Overview of exploratory and development wells drilled in Pakistan between 2013- 14 2012-2023



Sources: Pakistan Energy Yearbook 2023-24
PPIS (Pakistan Petroleum Information System)

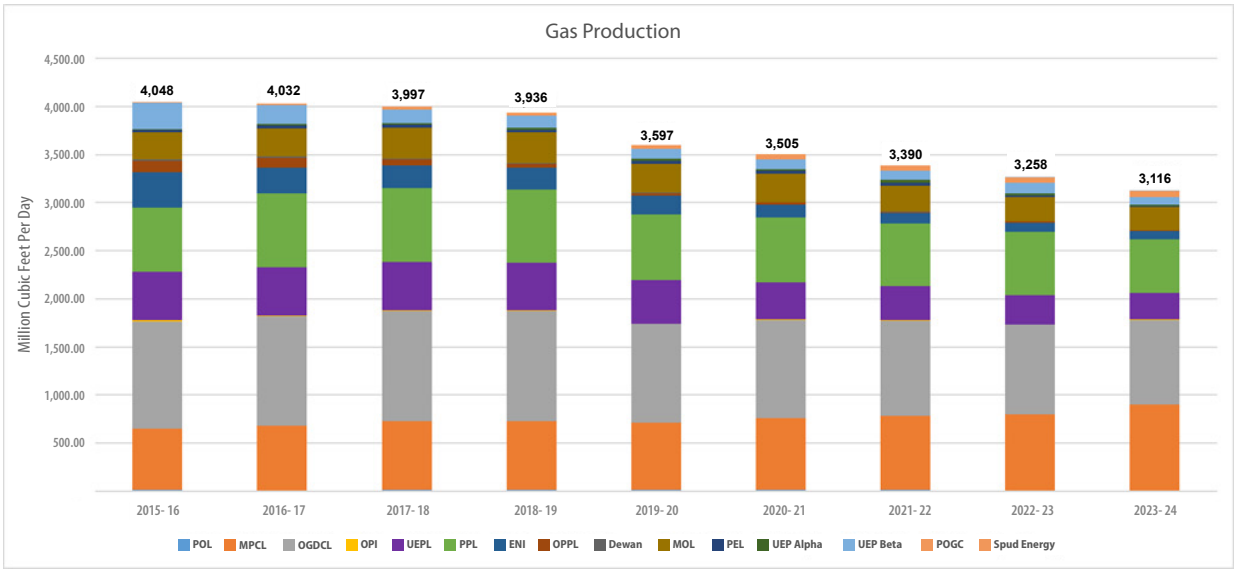
The indigenous production of oil and gas in Pakistan is much lower than the country's requirement. Indigenous oil and gas production is constrained due to technical, financial, regulatory as well as security factors. This necessitates import of crude oil, other oil products, LNG, and LPG in large quantities to meet the gap between demand and supply. Higher oil and gas prices in the global market and massive depreciation of the Pakistani rupee is making hydrocarbons more expensive, triggering external sector pressure, and widening the trade deficit of the country.

An overview of oil production by E&P companies from 2015 – 16 to 2023– 24 is as follows:



Sources: Pakistan Energy Yearbook 2023–24
PPIS (Pakistan Petroleum Information System)

An overview of Gas production by E&P companies from 2015 – 16 to 2023– 24 is as follows:



Sources: Pakistan Energy Yearbook 2023–24
PPIS (Pakistan Petroleum Information System)

02 MEASUREMENT OF CRUDE OIL AND GAS

In Pakistan, crude oil is measured by volume expressed as barrels (abbreviated as bbl). A barrel equates to 42 U.S. gallons. In some other parts of the world, crude oil is also measured by weight, such as metric tons. A metric ton of crude oil approximates to 7.33 barrels of crude oil, but the ratio varies since some crude oil mixtures are heavier per barrel than others.

In Pakistan, natural gas is measured in two ways:

1. By the amount of energy or heating value when burned, expressed in million British Thermal Units (abbreviated mmbtu); and
2. By volume, expressed in
    - thousand cubic feet (abbreviated as mcf),
    - million cubic feet (abbreviated as mmcf),
    - billion cubic feet (abbreviated as bcf), or
    - trillion cubic feet (abbreviated as tcf).

The ratio of mmbtu (energy) to mscf (volume) varies from approximately 1:1 to 1.3:1. The more natural gas liquids in the gas mixture, the higher the ratio, the greater the energy, and the "richer" or "wetter" the gas.

Volumes of crude oil, and natural gas combined are often expressed in barrels of oil equivalent (abbreviated boe) whereby gas volumes in mcf are converted to barrels on the basis of energy content. A commonly used ratio is one U.S. barrel of oil equates to approximately 5.6 mcf of dry gas or having an energy or heating value of 5.8 mmbtu. Some oil and gas companies also use a company-wide energy conversion ratio of 6 mcf per barrel whereas others use specific values for different fields.

Crude oil can be many different mixtures of liquid hydrocarbons. Crude oil is classified as light or heavy, depending on the density of the mixture. Density is measured in terms of API gravity. Heavy crude oil has more of the longer, larger hydrocarbon molecules and, thus, has greater density than light crude oil. Heavy crude oil may be so dense and thick that it is difficult to produce and transport to market. It is also more expensive to process into valuable products such as gasoline. Consequently, heavy crude oils, sell for much less per barrel than light crude oils but weigh more per barrel.

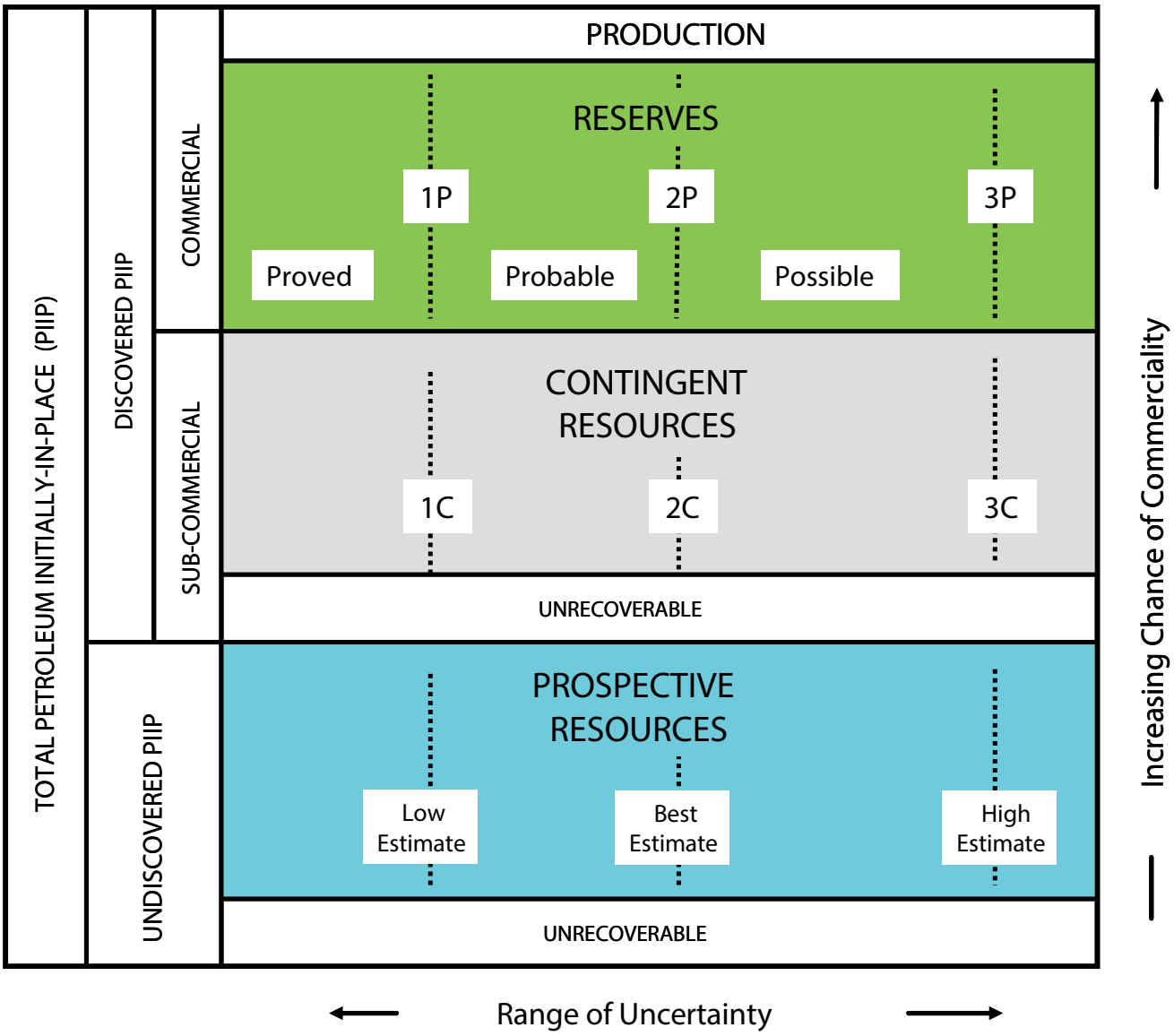
Both natural gas and crude oil may contain contaminants, such as sulphur compounds and carbon dioxide (CO2), that must be removed before sale. The contaminant hydrogen sulfide (H2S) is poisonous and, when dissolved in water, is corrosive to metals. Natural gas and crude oil high in sulphur compounds (generally above 0.5% in weight) are called sour gas and sour crude oil as opposed to sweet crude oil (generally below 0.5% in weight) or intermediate (between sour and sweet). Some crude oils contain small amounts of metals that require special equipment for refining the crude.

03 CLASSIFICATION OF PETROLEUM RESOURCES AND RESERVES

The real assets of an E&P company are its underground petroleum resources.

Petroleum is defined as a naturally occurring mixture consisting of hydrocarbons in the gaseous, liquid, or solid phase. The term “resources” encompasses all quantities of petroleum naturally occurring on or within the Earth’s crust, discovered and undiscovered (recoverable and unrecoverable), plus those quantities already produced. Further, it includes all types of petroleum whether currently considered “conventional” or “unconventional.”

Resource evaluations are focused on those quantities that can potentially be recovered, processed, and marketed in commercial quantities.



Source: Figure 1-1: Resources Classification Framework

Figure 1-1 is a graphical representation of the resources classification which defines the major recoverable resources classes: Production, Reserves, Contingent Resources, and Prospective Resources, as well as Unrecoverable Petroleum.

The "Range of Uncertainty" reflects a range of estimated quantities potentially recoverable from an accumulation by a project, while the vertical axis represents the "Chance of Commerciality", that is, the chance the project will be developed and reach commercial producing status. The following definitions apply to the major subdivisions within the resource classification:

TOTAL PETROLEUM INITIALLY-IN-PLACE is that quantity of petroleum that is estimated to exist originally in naturally occurring accumulations. It includes the quantity of petroleum that is estimated, as of a given date, to be contained in known accumulations prior to production plus those estimated quantities in accumulations yet to be discovered (equivalent to "total resources").

DISCOVERED PETROLEUM INITIALIY IN PLACE is that quantity of petroleum that is estimated, as of a given date, to be contained in known accumulations prior to its exploration.

PRODUCTION is the cumulative quantity of petroleum that has been recovered at a given date.

Multiple development projects may be applied to each known accumulation, and each project will recover an estimated portion of the initially-in-place quantities. The projects can be subdivided into Commercial and Sub-Commercial, with the estimated recoverable quantities being classified as Reserves and Contingent Resources respectively, as defined below.

RESERVES are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must further satisfy four criteria: they must be discovered, recoverable, commercial, and remaining (as of the evaluation date). Reserves are further categorized in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterized by development and production status.

CONTINGENT RESOURCES are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations, but the applied project(s) are not yet considered mature enough for commercial development due to one or more contingencies. Contingent Resources may include, for example, projects for which there are currently no viable markets, or where commercial recovery is dependent on technology under development, or where evaluation of the accumulation is insufficient to clearly assess commerciality. Contingent Resources are further categorized in accordance with the level of certainty associated with the estimates and may be subclassified based on project maturity and/or characterized by their economic status.

UNDISCOVERED PETROLEUM INITIALLY-IN-PLACE is that quantity of petroleum estimated, as of a given date, to be contained within accumulations yet to be discovered.

PROSPECTIVE RESOURCES are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects. Prospective Resources are further subdivided in accordance with the level of certainty associated with recoverable estimates assuming their discovery and development and may be sub-classified based on project maturity.

UNRECOVERABLE is the portion of Discovered or Undiscovered Petroleum Initially-in-Place quantities which is estimated, as of a given date, not to be recoverable by future development projects. A portion of these quantities may become recoverable in the future as commercial circumstances change or technological developments occur; the remaining portion may never be recovered due to physical/chemical constraints represented by subsurface interaction of fluids, and reservoir rocks.

04 RISKS SPECIFIC TO THE EXPLORATION AND PRODUCTION INDUSTRY

Some of the major risks specific to the E&P industry are enumerated below:

4.1 FAILURE OF EXPLORATORY DRILLING EFFORTS

Exploration for oil and gas involves significant risks including the risk of dry holes (not finding hydrocarbons altogether) or failure to find commercial quantities of hydrocarbons. The inherently risky nature of oil and gas drilling and the significant uncertainties involved, often result in unsuccessful wells. Factors which may contribute to these risks and uncertainties include, but are not limited to, incorrect prognosis of the geological and geophysical models, unexpected sub-surface drilling conditions, equipment failures, blowouts /accidents, and shortages or delays in the delivery of critical equipment required for a particular well.

4.2 INABILITY TO REPLACE OIL AND GAS RESERVES

The continuity of an E&P company's operations and its financial condition are substantially dependent on its ability to develop and sell oil & gas. Unless it is able to replace produced oil & gas on a timely basis, its reserves will decline and eventually deplete. The depletion of reserves below a critical threshold may adversely impact its financial condition and in extreme cases, its ability to function as a going concern.

4.3 UNCERTAINTIES IN ESTIMATING OIL AND GAS RESERVES

Being a sub-surface phenomenon thousands of feet below the ground, estimating the nature, size and extent of oil and gas reserves involves inherent complexities and uncertainties. These uncertainties arise due to a number of assumptions and variables required to estimate the reserves including:

a. The quality of available geological & geophysical reservoir technical data along with its interpretation and judgment,
b. The results of actual drilling, testing and actual production after the date of the estimates, which may necessitate substantial upward or downward revisions
c. Projections regarding future rates of production.

Many of the factors, assumptions and variables involved in estimating reserves are subject to change over time and therefore affect the estimates of oil & natural gas reserves.

4.4 CHANGES IN PRICES OF CRUDE OIL AND GAS

Both oil and gas are commodities which have a history of price volatility. Higher crude oil price is the single largest variable that affects an E&P company's operations, financial conditions. However lower crude oil prices have an adverse impact on the operations, and cash flows of an E&P company.

Crude oil and gas prices are subject to international supply, demand and other factors, many of them not in control of E&P companies. All these factors can affect the global balance between demand and supply for oil prices. These factors include:

a. Disruptions to production of oil & gas producing countries due to local instability (Iraq, Libya etc.) or international conflicts e.g. the recent Iran–Israel war.
b. Geopolitical and economic developments, including for example, international or bilateral sanctions imposed on certain significant oil-producing countries
c. The influence on production by Organization of Petroleum Exporting Countries (OPEC) plus which, through its member countries, controls a significant portion of the world's supply of oil
d. The complex dynamics of global and regional economic growth and its relationship with oil and gas demand
e. Success in developing and applying new technologies
f. Government regulations, including the implementation of national or international laws or regulations intended to limit greenhouse gas emissions, which could impact the prices of hydrocarbons;
g. The availability of alternative sources of energy such as Solar/Wind etc.

4.5 HEALTH, SAFETY AND ENVIRONMENTAL RISKS

The potential impacts of accidents and oil spills or gas leakages to health, safety and the environment can be catastrophic for an E&P company due to the difficulties in handling hydrocarbons containment and other factors. Failure to manage these risks effectively could result in injury or loss of life, damage to property, environmental damage, and could result in regulatory action, legal liability, and significant financial consequences.

4.6 REGULATORY APPROVALS AND SECURITY

E&P companies often operate in remote environments, areas with hostile security situations or in environmentally sensitive locations. For timely project execution, it is imperative that the necessary regulatory approvals and security clearances are in place, which often involves dealing with a number of regulatory agencies. Delays in obtaining the requisite approvals or clearances or renewals of the same, adversely affects an E&P company's ability to execute its plans.

Further, land acquisition disputes and ecological damage may cause social backlash; increasing pressure to comply with environmental laws such as increases cost, non-compliance risks, fines and shutdowns.

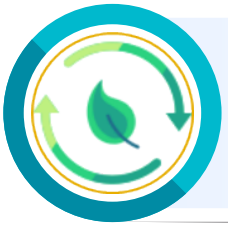
05 VARIOUS PHASES OF E&P ACTIVITIES

EXPLORATION PHASE. Main activities in this stage include geological works, seismic activities and exploratory wells.

APPRAISAL PHASE. In case of discovery, additional activities (wells seismic data) are carried out to determine the size of discovery. Following appraisal, a development plan is prepared to generate optimum value from the discovery. Usually all lease and commercial agreements are finalized at this stage.

DEVELOPMENT PHASE. Based on the development plan, field development activities start. These include setting up a production facility and drilling of production wells together with pipeline networks.

PRODUCTION PHASE. Production activities commence. Development activities usually continue during this time as more knowledge of the reservoir is obtained.



DECOMMISSIONING PHASE. Upon the end of field life, decommissioning activities commence with the aim to dismantle all facilities and bring the lease area to original condition.

5.1 EXPLORATION PHASE

To commence any exploration activity, the first step is to acquire and enter into an exploration license with the Government of Pakistan (GoP) to carry out the E&P activities in a defined area (called Exploration Area). Exploration licenses are awarded by the Directorate General Petroleum Concessions (DGPC), Petroleum Division, Ministry of Energy.

The GoP normally grants an exploration license through a bidding process. The license is awarded to the company meeting Technical and Financial qualification criteria which commits the maximum number of units for the work program. The value of one unit is US$ 10,000. The work program comprises of how many kilometers of seismic data will be acquired, processed, interpreted and mapped; how many wells will be drilled during the term of the exploration license. The exploration license is for a specific period, during which the committed work program has to be carried out. In case the committed work program is not performed, the undischarged work program can be transferred to another exploratory block subject to DGPC's approval. Otherwise, the company is obliged to pay the penalties to the GoP for the unfulfilled minimum work program. According to Pakistan Petroleum Policy 2012 (PP 2012), the license period is 5 years with a first phase of 3 years and a second phase of 2 years, with the option to get an extension of 1 year in each phase, subject to the commitment of the additional work program.

The license can be awarded to one company or a consortium of companies in the form of a Joint Venture (JV). A company's right to explore under the license or the share of each consortium company in the JV for the right to explore under a license is known as the working interest in the exploration license/petroleum concession. According to PP 2012, local E&P companies shall have a minimum working interest of 15% in Zone-I, 20% in Zone-II and 25% in Zone-III on full participation basis i.e. required minimum Pakistani working interest, whereas for Zone O the License holder is Government Company (GHPL) as detailed below.

According to PP 2012, for the purposes of petroleum licensing, Pakistan will be divided into following four onshore and one offshore Zones, on the basis of risk and investment requirements. Zonal Area Map is attached as Annexure-1.

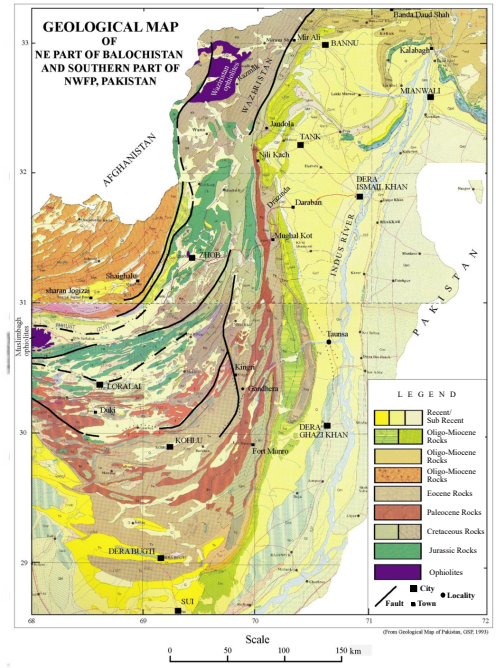
- Zone 1 (F)- Frontier Basins [Kharan, Pishin and the areas merged into Khyber Pakhtunkhwa (previously FATA)]
- Zone I – Southern Balochistan (Makran) and Potwar Basins.
- Zone II – Kirthar, East Balochistan, Punjab platform and Suleman Basins
- Zone III – Lower Indus Basin
- Zone O – Offshore - shallow, deep and ultra-deep

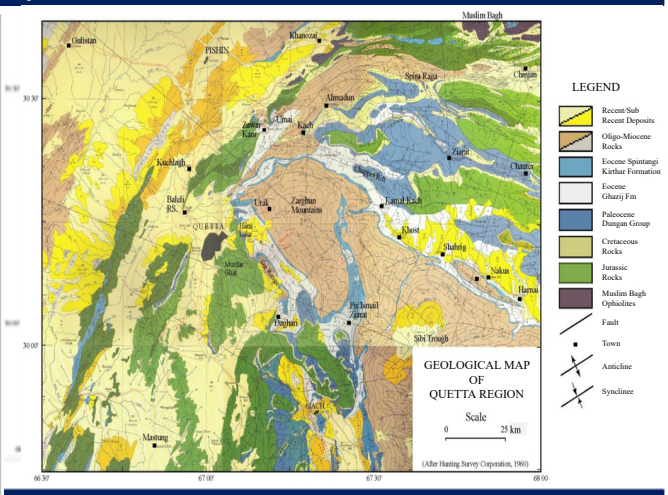
Exploration activities include the following:

- Geological studies of the area for which exploration license has been granted
- Geophysical study which is mainly seismic data acquisition as well as the processing and interpretation of the acquired data. In some cases, non-seismic surveys (gravity and magnetic etc.) are also conducted with relatively less investment. However, the information obtained from these surveys provide limited information and cannot be an alternate to the seismic data.
- In addition, vintage data (geological and geophysical) available with the DGPC is also evaluated to determine the prospectivity of the area or to identify the best area for new seismic data.
- During the exploration phase, usually 2D reflection seismic data is acquired whereas at the appraisal and development stage 3D reflection seismic data is acquired. The cost of 2D acquisition is considerably lower than that of 3D. 2D data is acquired over larger areas whereas 3D data is usually acquired on smaller area based on the results of 2D seismic for optimizing and decision making as to the number of wells to be drilled in a discovery area.
- Seismic data interpretation helps in determining the location where it is most appropriate to drill a well.
- Drilling of an exploration well.

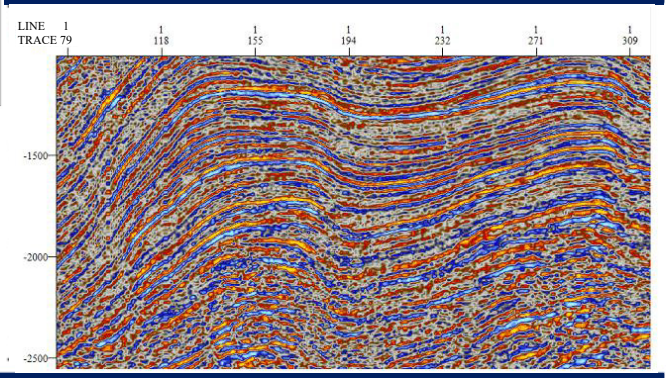
If the drilling results of an exploratory well confirm the presence of hydrocarbons (i.e. probable commercial discovery) then the activities move from the exploration phase to appraisal phase.

Geological Maps of Balochistan Area

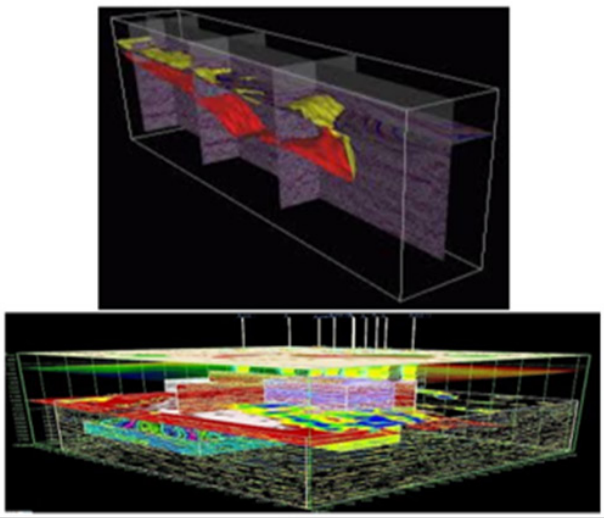


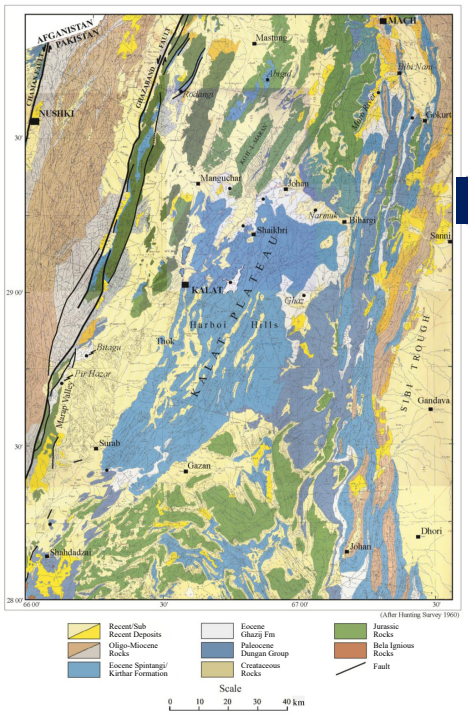


2D Seismic Data



3D Seismic Data





Annexure 1: Zones Map of Pakistan.

Sources: **https://www.mdpi.com/2076-3263/3/3/466**

5.2 APPRAISAL PHASE

Objective of the appraisal activities is to determine the size, nature (i.e. gas, oil or condensate) and quality of the discovered reserves, including extractable reserves and to assess if the discovery is commercially viable. Appraisal activities include the following:

- additional 2D or 3D reflection seismic data acquisition alongside the discovery area and interpretation of this data
- drilling of one or more additional wells to estimate the boundaries of the reservoir

Based on the drilling results of the appraisal activities, the size and nature of the discovery is determined and the economic evaluation is carried out to determine whether it can be classified as a commercial discovery. Economic evaluation is worked out, keeping in perspective the revenues and associated costs involved to generate these revenues. The revenues are calculated based on the estimated recoverable oil or gas and the price assumptions are based on best estimates of future price of international crude oil.

Whereas, the costs are calculated based on the cost of additional wells to be drilled, additional 3D seismic data to be acquired, oil and gas processing plants/infrastructure costs i.e. storage tanks and pipelines within the field, to the nearest refinery and/or to the gas delivery point, and the operating cost to be incurred.

Royalties, taxes, duties, levies, production bonuses (payable to government based on production levels to be achieved from the area), social welfare obligations stated in the Production Concession Agreement (PCA) and in Production Sharing Agreement (PSA) etc. are also factored in the economic calculations. If the economic net result is positive i.e. positive Net Present Value (NPV) at a reasonable discount rate, it would be deemed as a commercial discovery.

The economic evaluation process is usually the final step in the long process of technical and financial evaluation that must be done before any investment decision is made.

Keeping in view the commercial discovery economics, a Field Development Plan (FDP) is prepared and submitted to the DGPC. If the DGPC approves the FDP, the Development and Production Lease (D&P Lease) is granted by the DGPC for the discovery area out of the total exploration area for which the exploration license was awarded. D&P Lease area is usually much smaller compared to exploration area. The D&P Lease period depends on number of years required to produce the reserves discovered under a particular commercial discovery, subject to a cap of twenty-five (25) years. The lease may be renewed for another five years if commercial production is continuing. Under SRO 371 of Ministry of Energy (Petroleum division) dated March 07, 2024 GoP has made amendment to the Pakistan Onshore Petroleum Rules 2013 whereby the Authority may renew or re-grant the lease term till commercial

viability of the field provided that leaseholder agrees , at least one year prior to expiry of the lease period, to pay an amount equivalent to 15% of the wellhead value of petroleum produced to the GoP which shall be equally divided between Federal and the Provincial Government concerned.

Appraisal period at times also includes Extended Well Testing (EWT) phase, whereby, for certain period, prior to submission of FDP with the DGPC, test production is obtained from appraisal wells. This is done to ensure that there is a steady flow of hydrocarbons from the discovery made and that it can be classified as a commercial discovery. EWT production is also invoiced to the customers (i.e. refineries and gas distribution companies), though gas EWT production is subject to a discount of 5% according to the PP 2012.

The process of finalizing the Gas Sales Agreements with the GoP nominated buyers also commences at this stage.

5.3 DEVELOPMENT PHASE

Development activities normally commence once DGPC approves the FDP and grants the D&P Lease.

Development activities include the following:

- Additional seismic data acquisition (usually 3D).
- Drilling of additional wells as per FDP. The wells may also include water disposal well to dispose-off the water produced along with oil or gas.
- Building of infrastructure:
    - Access roads.
    - Buildings, control room building, field offices, warehouses etc.
    - Plants; gas processing facility, oil and water separation facility, oil pumping station, oil storage tanks, etc.
    - Pipelines within field to connect the wells to the plants and pipelines to connect to the refineries or gas distribution network of SNGPL/SSGCL for

This is a capital-intensive phase. Usually it goes through a value assurance process to ensure that maximum value is generated by putting up the most optimal plant size and wells network.

5.4 PRODUCTION PHASE

Production activities include, but are not limited to the following:

- Pumping out oil and gas from the wells, in case natural flow is not there due to less pressure in reservoir.
- Separation of oil, gas, and water in the processing facilities

- Pumping oil into the pipeline to a refinery or storing in tanks; and transporting oil to refineries and oil export terminals in case pipeline is not feasible.
- Processing of gas at plants to produce pipeline quality consumable gas and LPG. Gas is sold to the gas distribution companies through pipelines whereas LPG is disposed off through marketing companies via bowsers.
- Disposal of produced water into water disposal wells.
- Installation of compressors to maintain the production in case the reservoir pressure drops.
- Well intervention jobs (workovers) in case any restrictions develop in the wells.

As production commences and continues, a better understanding of reservoir characteristics is established. Based on revised understandings, companies endeavor to optimize economic value through additional development activities. For instance, drilling of infill wells to accelerate production, enhancing production facilities in case reservoir size appears bigger than the original estimates and putting compression facilities if pressure from reservoir drops resulting in production going down.

5.5 ABANDONMENT PHASE

Abandonment or decommissioning activities are carried out at the end of the D&P Lease period or when the oil & gas reserves have been extracted to the extent that it is no more commercially feasible to extract the reserves or the reserves have expired before the end of D&P Lease period. Abandonment activities include the following:

- Plugging and abandoning the wells, removing the tubing (if necessary) and other equipment on well head and putting the cement plugs in the well to secure that no flow of hydrocarbon shall occurs at a later stage.
- Dismantling of the buildings, plants, tanks, pipelines and other equipment.
- Reinstating the land used for E&P activities to its original condition.

06 REGULATORY FRAMEWORK

6.1 REGULATIONS RELATED TO E&P ACTIVITIES

The Ministry of Energy, Petroleum Division (MEPD) under Regulations of Mines Act 1948, Petroleum Policies and relevant Rules govern the E&P activities in Pakistan. The Petroleum Concession Agreements (PCAs) and the Production Sharing Contracts (PSCs) include additional supplemental regulations. Petroleum Policies and Rules are reflected in the Model PCAs and PSCs.

Internationally used Model PCAs, PSCs and other commonly used agreements in E&P industry such as Farm-in/Farm-out Agreements, Assignment Agreements, Joint Operating Agreements, Accounting Procedures, etc. developed by the Association of International Energy Negotiators (AIEN), Formerly Association of International Petroleum Negotiator (AIPN) are available to the E&P industry at its website,

which can be accessed by paying a nominal fee. AIEN is an independent not-for-profit professional membership association that supports international energy negotiators around the world and enhances their effectiveness and professionalism in the international energy community.

6.2 REGULATORS FOR E&P ACTIVITIES

MEPD is mainly represented by DGPC being the primary regulator. Whereas, Directorate General of Oil (DG Oil) regulates the crude oil sales to refineries and the sale of refined products such as diesel, petrol, kerosene oil, etc. by the oil marketing companies such as Pakistan State Oil (PSO), Parco Gunvor Limited (PGL), Attock Petroleum Limited (APL), Gas & Oil (GO) and Wafi Energy Pakistan Limited (WEPL) etc. The Directorate General of gas (DG Gas) regulates the gas sales to Sui Northern Gas Pipelines Company Limited (SNGPL) and Sui Southern Gas Company Limited (SSGC). Oil and Gas Regulatory Authority (OGRA) regulates the pricing for both the oil and gas with the responsibility to issue the periodic price notifications.

Prior approval of DGPC is required for all major activities including, but not limited to, the following:

- Commencement of each activity i.e. seismic data acquisition, drilling, building of infrastructure, abandonment of wells and infrastructure etc.
- Extension of an exploration license.
- Relinquishment or surrender of exploration license.
- Grant and extension of the D&P Lease.
- Sharing of the geological/geophysical wells data to any non-related party.
- Assignment/sale of working interest in any PCA or PSC to another company.

07 AGREEMENTS WITH THE GOVERNMENT OF PAKISTAN

Following are two types of contracts/agreements which the companies need to enter into with the GoP related to E&P Activities:

- Petroleum Concession Agreement (PCA) – Applicable for onshore areas
- Production Sharing Contract (PSC) – Applicable for offshore areas

7.1 PETROLEUM CONCESSION AGREEMENT (PCA)

Under PCA, a company or consortium of the companies (called the JV Partners) are the license holders and lease holders of exploration license and D&P Lease respectively. Along with the PCA, the JV Partners also enter into a Joint Operating Agreement amongst themselves, which stipulates the mechanism with respect to the joint operations, accounting and other matters.

The company or companies make the expenditure for all phases of E&P activities at their own risk and are the owners of oil and gas produced, which are invoiced to customers (i.e. the refineries and the gas distribution companies) in the name of respective JV Partner. Under the PCA, one of the JV Partner is appointed as the operator who is responsible for carrying out the E&P activities on behalf of the JV Partners, maintaining the books of accounts of the joint operations and dealing with the customers and regulators on their behalf. Under the PCA, the JV Partners are liable to pay the following to the GoP:

- Royalty @ 12.5% of the gross revenues
- Corporate taxes
- Windfall levy
- Other levies (sales tax, excise duty, etc.).
- Production bonus.
- Amounts and threshold of production are stated in the relevant PCA and depend on the Zone under which the area for which PCA has been awarded.

7.2 GOVERNMENT HOLDINGS RIGHTS TO WORKING INTEREST UNDER THE PCAs

There is a 2.5% working interest on full participation basis for GHPL and 2.5% carried working interest for the Provincial Government Holding Company (PGHL), in any exploration license. In the event of a commercial discovery the carried costs have to be reimbursed by the PGHL to the carrying JV partner(s). GHPL/Provincial Government Holding Company have the option to accept or reject the participating working interest.

7.3 PRODUCTION SHARING CONTRACT (PSC)

Under PSC, the Government Holdings Company (GH) is the license holder of exploration license or leaseholder of D&P and the company or consortium of companies (JV Partners) work as contractor to the GH. Expenditure incurred by the companies under the Exploration and Appraisal Phase is done at their own risk as a contractor of the GH. Upon a commercial discovery, companies manage and sell the petroleum produced for and on behalf of the GH. The companies recover their past costs related to exploration, appraisal, development, production and abandonment from revenues derived from sales of petroleum produced up to a certain percentage of production called cost oil/gas (85% of revenue generated as stated in PP 2012) until the past cost is recovered. The remaining production, called profit oil/gas, is shared between GH and companies on an agreed percentage stated in Article 5.6 of the PP 2012.

The GH and companies i.e. contractor pay the following to the GoP:

- Royalty at percentages of revenue as stated in Article 5.1.1 of PP 2012
- Corporate Taxes
- Windfall levy on production of oil and gas
- Other levies (sales tax, excise duty, etc.)
- Production Bonus. amounts and threshold of production are stated in the PSC

To incentivize the E&P industry, indigenous production of oil and gas being a substitute of imports, the payment related to indigenous production of oil and gas is made to foreign companies 100% in foreign currency (US Dollars), whereas the local companies are paid 30% in foreign currency (US Dollars) and 70% in Pak Rupees. This is also done because most of the investments such as import of machinery, equipment, material and drilling/seismic services, etc. in this sector are made in the foreign currency.

7.4 SALE OF PETROLEUM (CRUDE OIL, CONDENSATE GAS OR LPG)

The first right to buy the petroleum from the producer (i.e. D&P Lease Holder/JV Partner) is with the GoP. The GoP exercises this right by nominating a refinery in for purchase of crude oil/condensate and a gas distribution company (such as SSGCL, SNGPL, or both) for purchase of gas. LPG can be sold to LPG distribution companies, which are licensed by the GoP.

Subject to considerations of internal requirements and national emergencies, E&P companies are allowed to export their share of crude oil and condensate as well as their share of gas based on export licenses to be granted by the concerned regulator.

Subject to overall market demand, E&P companies may request the GoP to purchase 90% of their share of pipeline specification gas through a nominated buyer (i.e. SSGCL or SNGPL) to meet the internal demand of Pakistan in an economical manner, provided there are no infrastructure constraints. The E&P Companies have the right to sell upto 35% of their share of pipeline specification of gas to a private buyer in accordance with the framework approved by the CCI.

The JV Partners (for PCA) or the contractors (for PSC) have to enter into sale agreements with the refiners and the gas distribution companies, laying down the terms of the sales and payment thereof. The relevant regulator approves the terms of sales agreements and these terms are agreed before the development activities are commenced.

The primary difference between PCA and PSC is that under the PCA, the lease holders are exploration companies that are entitled to the production from the lease area in return for payment of royalty and other levies. On the other hand, in case of PSC the right to production of hydrocarbons rests with the Government Holding (as first party) whereas exploration companies, in return of their exploration activities, are entitled to recover costs incurred and part of the profits generated in the form of oil or gas produced.

08 PRICING

The formula for calculating the selling price of crude oil, and condensate and gas is stated in the relevant contract with GoP (i.e. PCA/PSC) which is linked to international crude oil price and the formulas stated in the PCA/PSC. Examples of calculating crude and gas prices are illustrated as Annexure 2. LPG's selling price is subject to open market competition.

Crude Oil

The Producer Policy Price for crude oil delivered at the nearest refinery gate shall be equal to C&F price of a comparable crude oil or a basket of Arabian/Persian Gulf crude oils (Reference Crude or RC) plus or minus a quality differential between the RC and the local crude oil. No other adjustment or discount will apply other than windfall levy. C&F price will be arrived at on the basis of FOB price of imported crude oils into Pakistan plus freight on AFRA, which is deemed chartered rate.

Condensate

The Producer Policy Price for condensate will be the FOB price of internationally quoted comparable condensate delivered at the nearest refinery gate plus or minus a quality yield differential, based on the value in the Arabian Gulf spot products market of the crude oil/condensate. No other adjustment or discount will apply other than Windfall Levy.

Liquefied Petroleum Gas (LPG)

Maximum LPG producer price is notified by OGRA every month.

Gas Pricing

The price for Associated or Non Associated Gas will be indexed to the C&F price of a basket of Arabian/Persian crude oil import in Pakistan during the first six months period immediately preceding the relevant price notification period (Import Basket) as published in an internationally recognized publication acceptable to the parties for various zones is illustrated at annexure 7 to 12 of PP 2012. C&F Price will be arrived at on the basis of FOB price of imported crude oils into Pakistan plus freight on Arrange Freight Rate Assessment (AFRA), which is deemed chartered rates. The RCP ceiling of USD 110/barrel would be reviewed after every five years or as and when the pricing dynamics significantly change in international market.

09 FOREIGN EXCHANGE AND BORROWING RESTRICTIONS

According to the terms of the PCAs and PSCs, foreign E&P companies are required to arrange the foreign exchange from their own sources for the expenditure to be made for E&P activities in Pakistan. Further, these companies, under the terms of PCA / PSC, cannot borrow in local currency from local banks / financial institutions in Pakistan. Due to this restriction, foreign E&P are paid for their share of production of oil & gas in foreign exchange (US Dollars) as stated above. However, there is no restriction on Pak Rupee borrowing for local E&P companies.

Local E&P companies on a case-to-case basis are entitled during the exploration phase to receive foreign exchange from GoP against payment in Pakistani currency to meet their daily obligations under permits, licenses and PCAs/PSAs. After commercial discovery, local E&P companies are paid up to 30% of their sale proceeds in foreign currency to meet their day-to-day operational requirements. For project financing after commercial discovery, local E&P companies will be required to make their own foreign exchange arrangements, except for companies in which GoP or provincial government holds majority shares.

For project financing related to development activities (before commencement of commercial production), the local E&P companies may borrow in foreign currency against future foreign currency receipt (30% stated above) from production. Currency devaluation risk hedging may not be required as the 30% revenues are going to be in foreign currency based on pricing formula stated earlier in sale of petroleum section.

10 OPERATOR AND CONDUCT OF E&P ACTIVITIES

Usually more than one company is the license/lease holder (under PCA) and contractor (under PSC) due to inherent risk of the exploration business. Therefore, one of the companies is selected to act as an operator on behalf of the JV Partners, who conducts the E&P activities for and on behalf of all the JV Partners including GH. The JV Partners oversee the operations carried out by the operator through the Operating Committee, Finance Committee and Technical Committee, where all the JV Partners are represented. The Joint Operating Agreement (JOA) includes rules governing the rights and responsibilities of the Operator and how the business shall be managed/conducted amongst the JV Partners. JOA is an important document and part of PCA and PSC.

JOA usually contains the clauses related, but not limited, to the following:

Preparation of annual work program and budget by operator and its approval by the JV Partners.

- Authorization of Expenditure (AFE) for some specific activities or having an expenditure equal to or more than certain pre-agreed thresholds by all JV Partners.
- Conduct of meetings of JV Partners (such as Operating Committee, Finance Committee and Technical Committee) as well as the minimum number of meetings to be held in a year.
- Minimum percentage for approval of work program and budget as well as AFEs in case there is no unanimous agreement between the JV Partners. There are exceptions for specific activities, such as agreement on commercial discovery and development plan, which would require unanimous approval of the JV Partners.
- Preparation of monthly, quarterly and annual cost statements by operator and submission thereof to other JV Partners. Accounting basis are used for preparing such statements.
- Cash calling (by operator from the JV Partners) to be done on a monthly basis in advance for anticipated expenditure for the following month so that operator is cash neutral for JV activities.
- Statement of over/under advance excluding accrual to be provided to JV Partners.
- Audit of the JV operations in accordance with the JOA and of the annual cost statements by third party auditors as well as JV Partners.
- Reporting of production and other data to the JV partners.
- Reporting of all other technical data on a periodic basis required by the JV Partners.
- Management of JV assets, and inventory including approval process for disposal thereof.
- Dispute resolution mechanism.

11 LAND ACQUISITION

Large areas of land are required to carry out the E&P activities.

As mentioned earlier, the subsurface property rights belong to the country. However, access to the surface (land) is obtained from the owners of the land which could be private land owners or the GoP. Land is acquired either via purchase or rental/lease (short term or long term). During the exploration phase, the land is usually taken on a short-term rental/lease, whereas, for development and production phase, it is either purchased or taken on long-term rent/lease.

Acquiring land is quite intensive work as sometimes the land is used for agriculture, industrial or residential purposes. The companies would normally have a separate department for this job.

12 PROCUREMENT

Most of the material required for drilling and setting up processing facilities is imported. There is a concessionary import duty of 5% for the E&P Industry. The relevant custom legislation is SRO 678(1)/2004, which governs the rules applicable for the concessionary import duty. The duty is applicable for items that are not manufactured in Pakistan. The list of locally manufactured items is available in CGO No. 11/2007 which the Federal Board of Revenue (FBR) regularly updates.

The above concessionary import duty is also available to the companies providing the services to E&P industry. The regular duty is applicable if it is less than 5%. Further, since 2019 FBR has levied an additional import duty ranging from 2% to 7%. E&P Industry has agitated levying additional customs duty on the import but has not been successful in getting it removed so far. No sales tax is applicable on imports falling under SRO 678(1)/2004. For items to be imported, which do not fall under SRO 678(1)/2004 (i.e. items manufactured in Pakistan) all normal import duty, infrastructure, and sales tax are applicable.

In case any item is imported temporarily (for example, an equipment/tool imported by a service company from other country to be used for a specific job and to be sent back to that country), it can be cleared by custom authorities against a corporate/bank guarantee without levying any import duty etc. Custom authorities release the corporate/bank guarantee once the temporarily imported item is exported back or is surrendered to custom authorities.

13 HEALTH, SAFETY AND ENVIRONMENT (HSE)

Being a highly technical industry dealing with inflammable/combustible products, Health, Safety and Environment (HSE) is of utmost importance for E&P Company. Therefore, every company in the E&P industry has comprehensive HSE policies and procedures exhibiting significant focus on HSE. HSE function of a company provides an integrated support for assurance and control of technical and administrative operations, work performance, and asset integrity. Besides inculcating health and safety awareness, they adopt best operational practices in strict compliance with local statutory as well as international HSE standards.

Capacity building of the staff is done by providing regular HSE trainings such as sessions on emergency response, asset integrity and process safety etc. HSE guidelines and procedures are developed; and company staff and the contractor / supplier's staff are regularly trained based on these guidelines and procedures. These guidelines and procedures are embedded into the management and operational processes. Anyone visiting the fields and office locations of E&P Company are required to follow these guidelines and procedures.

14 TRAINING AND DEVELOPMENT

Being a highly specialized industry with continuous technological advancements, it is crucial to provide specialized training and development opportunities to the staff. Most of the companies have a dedicated section within the HR department or a separate training and development department for continuous training of the staff involved in the operations. The PCA/PSC specifies a minimum annual amount for the training of company's staff as well as the GoP staff related to the E&P sector subject to the Training Guidelines.

According to the PCA/PSC, if the annual minimum amount or a portion thereof remains unspent, the differential is required to be deposited with the GoP. However, E&P companies generally spend much more on the training activities/programs than the annual minimum amount.

Yearly training program, and expense report is required to be submitted to the DGPC.

15 FINANCE, ACCOUNTING AND TAXATION

The finance function in E&P industry is similar to any other industry. However, following are the additional finance activities related to E&P Industry:

15.1 CALCULATION OF THE ECONOMIC EVALUATION FOR FDP

Since activities in E&P industry are carried out as projects, project portfolio management is an integral part of the decision-making process in which finance department plays an important role. For this reason, comprehensive value assurance frameworks provide gate checks that a project needs to go through in order to be sanctioned for execution. These are based on both technical justification as well as economic studies. The economic studies are carried out for development projects as well as for exploration activities taking into account the probability of success of various initiatives, expected costs, and reservoir size involved.

The most important decision to move from exploration phase to development and production phases is to make an assessment that whether a discovery can be classified as a commercial discovery for which economic evaluation is needed. Finance function plays a vital role in preparing the economic evaluation/model.

15.2 FINANCE COMMITTEE OF THE JV

In the finance committee meetings, the work program and budgets for each Exploration License/D&P Lease are presented and approved by the JV and Government Holding (in case of PSC) on yearly and half-yearly basis. The finance executives are responsible to ensure that the budgets are prepared in accordance with provisions of the PCA/PSC as well as the JOA.

Conducting the meetings to satisfy the JV partners, obtaining approval for the work program and budgets are also the responsibilities of the finance executives. They are also responsible to provide the explanation for the variance between actual cost and previously approved budget for yearly/half-yearly period as well as for the projects' cost variance, which are spread over more than a year.

15.3 MANAGEMENT OF JV FUNDS

To conduct the JV business, the operator has to ensure that the requisite funds are available on time and each JV partner is contributing according to their working interest. The operator has to request the requisite funds in advance from each JV partner. This request of funds in the E&P industry is called cash calls. The finance executives of the operator ensure that sufficient funds are obtained from the JV partners so that the work program is carried out by the operator in a timely manner. However, they have to ensure that surplus funds are not accumulated in the JV accounts as non-operating partners would object to that.

15.4 FINANCIAL STATEMENTS OF JOINT VENTURE (JV) ACCOUNTS

According to the JOA, the operator is responsible for maintaining the books of account of the JV and to provide the periodic (monthly, half yearly and annual) financial statements (Joint Venture Accounts or Joint Operating Accounts) related to the JV for each Exploration License/D&P Lease.

These financial statements contain the information related to the expenditure made for each phase (i.e., Exploration, Appraisal, Development, Production and Abandonment), advances received from JV partners in the form of cash calls and over/under advance position of each JV partner.

Further the key reports to be shared by operator are Monthly Cost statement (Joint Interest Billing Statement JIB), Monthly Cash calls, and Authorization for Expenditure Reports (AFE), Progress Report, Production & Sales Report, and Sales invoices (If applicable).

15.5 COMPLIANCE WITH LAWS, RULES, PCAS/PSCS/JOA

It is the responsibility of the finance executives to ensure compliance with the provisions of all applicable Petroleum Laws (in addition to company law, tax laws) and Petroleum Policies and Rules (e.g. PP 2012 and Petroleum Rules 2013). Further, they are also required to ensure compliance with provisions stated in the PCAs/PSCs and JOAs including its accounting and finance procedures (e.g., provisions related to cash calling adequate funds, budgeting, periodic reporting, authorization of expenditure for expenses beyond certain threshold, management of inventory, approval before award of contract beyond certain threshold, etc.)

15.6 METHODS OF ACCOUNTING

E&P companies can opt for any of the two methods of accounting for the exploration and development activities:

1. Successful Efforts Method
2. Full Cost Method

1. Successful Efforts Method:

This is the most commonly used method of accounting in the oil and gas industry.

Exploration Cost:

- Exploration Cost including the geological & geophysical costs, surface lease rentals etc. are expensed as and when incurred except for the exploration well cost which is specific to the drilling of a well and related geophysical cost, that are initially capitalized.
- If exploration well is successful and the reserves are determined to be present, then the cost remains capitalized.
- If exploration well is unsuccessful then such well cost and related expenditure is also expensed.

Appraisal Cost:

- Appraisal Cost is also expensed as and when incurred except for the appraisal well cost which is initially capitalized.
- If appraisal well is successful and it is determined that commercially viable reserves are present for which commercial discovery notification is to be applied to the DGPC, then such well cost remains capitalized.
- If appraisal well is unsuccessful and it is determined that reserves are not commercially viable then appraisal well cost is also expensed.

Development Cost:

- All the development costs are capitalized. For unsuccessful development well, it is a common practice to keep the cost capitalized because development wells are usually part of the plan and the cost thereof is part of the economic evaluation for the preparation of the development plan. Even an unsuccessful development well provides subsurface information about the development area, which helps to optimize the location for the drilling of additional wells. Further, total capitalized cost for development activities is subject to amortization on Unit of Production (UoP) basis and impairment test. However, some companies follow a conservative approach and expense out the cost of unsuccessful development wells. Both approaches are acceptable industry practices. Development costs related to oil and gas properties are depreciated using Using of Production (UoP) method.
- Development cost of buildings and infrastructure are depreciated based on the determination of useful life of such assets.

Production Cost:

- All production costs are expensed as and when incurred to match the revenue generated from the sale of petroleum produced.
- In every industry, there are some cost elements that generate a debate whether the cost is to be capitalized or expensed. In E&P industry, the cost associated with interventions in producing wells after commencement of production is an element for which it needs to be assessed if this cost has to be expensed or otherwise. The well intervention in some cases is called Wells Workover. The guiding principle is that if the activity of intervention is to restore the existing production (due to some blockage in the well or obtaining data such as pressure in the reservoir etc.) then this cost is to be expensed. Whereas, activities to increase production are capitalized. For instance, additional perforation in the well bore to gain access to other formation, which was not accessed earlier or to put a cement plug in the well to stop the formation water entering into the producing hydrocarbon-baring zone. Other such activities include installation of injection equipment to convert a producing well into an injection well, deepening the well with additional drilling to gain access to another producible formation, sidetracking, (i.e. additional drilling sideways) an existing producing well if the production is obstructed (due to any reason) from the existing well bore etc.
- An important element of production phase is to pay the production bonus to the GoP. According to the PP 2012, following production bonuses are payable on a contract area basis as follows:

Onshore Petroleum Concession Agreement (PCA)

CUMULATIVE PRODUCTION (MMBOE)	AMOUNT (USD)
At start of commercial production	600,000
Upon reaching 30 MMBOE	1,200,000
Upon reaching 60 MMBOE	2,000,000
Upon reaching 80 MMBOE	5,000,000
Upon reaching 100 MMBOE	7,000,000

Offshore Production Sharing Agreement (PSA)

CUMULATIVE PRODUCTION (MMBOE)	AMOUNT (USD)
Within 90 days of start of commercial production	600,000
Upon reaching 60 MMBOE	1,200,000
Upon reaching 120 MMBOE	2,000,000
Upon reaching 160 MMBOE	5,000,000
Upon reaching 200 MMBOE	7,000,000

Accounting treatment for these bonuses is given below:

- Production bonus payable at the commencement of production is expensed when due.
- Production bonus amount payable upon reaching certain accumulated level of production (stated above) is accrued in proportion to production on periodic basis and the amount thereof is expensed in that period. Corresponding liability is settled upon reaching each threshold, when the payment is made to the GoP.

Abandonment Cost:

- Estimating the abandonment cost is quite complex. While The finance executives also play a crucial role in it. It is to be noted that the JV books of accounts and financial statements are based on receipt and expenditure. Therefore, the decommissioning costs are recorded in the JV books as and when incurred. However, the operator is responsible to provide the information related to decommissioning estimates to non-operating partners to make the accounting for decommissioning costs (stated below) in the corporate books of account.
- Abandonment or decommissioning cost is capitalized at the time of capitalization of the assets (e.g. well or infrastructure) for which abandonment will be required in accordance with the legal obligation and company policy. A long-term provision of decommissioning is created against such capitalization.
- The long-term provision is made for the present value amount capitalized to complete the double entry and to recognize the abandonment liability.
- In future years the capitalized cost is depreciated using UoP method.
- Provision is increased every year due to unwinding of discounting made at the time of creating the provision, so at the time of abandonment full amount (undiscounted) is available to meet the abandonment cost. The effect of unwinding and increasing the provision is charged to P&L every year as finance charges.

2. Full Cost Method:

Exploration Cost:

- All costs including the geological & geophysical costs, surface lease rentals etc. are capitalized and only expensed if ultimately it is determined that there is no discovery in the entire license area and the exploration license either expires or is surrendered earlier to DGPC.

Appraisal Cost:

- All costs are capitalized and only expensed if ultimately it is determined that there is no discovery in the entire area, and the exploration license either expires or is surrendered earlier to DGPC.

Development Cost: Same treatment as in Successful Efforts Method

Production Cost: Same treatment as in Successful Efforts Method

Abandonment Cost: Same treatment as in Successful Efforts Method

15.7 ACCOUNTING STANDARDS/GUIDELINES

For specific E&P activities, there is very little guidance available in the International Financial Reporting Standards (IFRS). IFRS 6-Exploration for and Evaluation of Mineral Resources focuses on the accounting for costs incurred during the exploration and evaluation phase and addresses the recognition, measurement, and disclosure of these expenditures. However, guidance can be sought from Accounting Standards Boards (FASB) Codification 932 (ASC 932) related to Extractive Activities of Oil and Gas. The FASB Financial is a private, non-profit organization standard setting body whose primary purpose is to establish and improve Generally Accepted Accounting Principles (GAAP) within the United States.

15.8 TAXATION

Similar to specialized accounting treatment, the taxation of the E&P industry also has its special dynamics. Income tax rates vary across the petroleum concessions ranging from 40% to 55% and are subject to the terms and conditions specified in the concession or production sharing agreement. The Income Tax Ordinance 2001/1979 has a separate schedule (Fifth Schedule) which contains the rules for the computation of taxes on profits and gains from the exploration and production of petroleum.

Calculation of Taxable income and liability is illustrated as Annexure 3.

16 SOCIAL WELFARE

E&P activities in Pakistan are generally carried out in less populated and under-developed areas, which are in need of necessities such as health, education, water and other social requirements. Due to this reason, each PCA and PSC provides annual minimum amount (based on the Zone under which PCA has been awarded and the current development and production status under the PCA/PSC) for social uplift of the population in those areas.

According to the DGPC guidelines on social welfare, E&P companies will open a joint bank account with DCOs/DCs concerned and will deposit the Social Welfare Contribution fund within one month of signing of the PCA and subsequently by 31st January each year. The interest accrued on the deposits will also be considered as part of the social welfare fund. If a PCA/Block falls in more than one district, separate bank accounts for each district shall be opened and funds apportioned according to their respective area. The funds are then released as and when the social welfare activities are carried out in coordination with the local government officials. Companies generally spend more than the minimum specified amount through their Corporate Social Responsibility (CSR) programs.

Following are some of the areas of social welfare where E&P companies have contributed for the last many years:

- Water supply – Drilling water wells as well as supplying water through water tankers and building water storage tanks for local communities in far-flung areas.
- Primary and secondary school education – Constructing school buildings/huts for small communities in far-flung areas and either handing over these buildings to the local governments or managing and operating the schools by providing teachers and administration staff as well as books and uniforms.
- Vocational institutes – Constructing buildings for vocational training and providing initial funding for buying necessary machines, tools and equipment.
- Solar energy – Installing solar panels and related equipment to provide electricity to schools, water supply projects and vocational institutes.
- Health facilities – Building and managing small hospitals and dispensaries to provide health services to local communities and facilitating in Hepatitis-B vaccinations.

In addition to the above, the PCA/PSA requires the E&P companies to undertake social welfare programs such as fight against narcotics, promotion of sports and rehabilitation of mentally retarded and handicapped children etc.

17 GLOSSARY

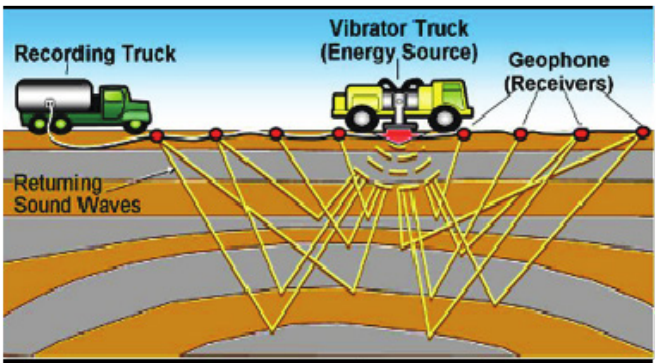
Geological Studies:

These are systematic investigation of the geology beneath ground for the purpose of creating a geological map or model. Geological field studies are carried out to prepare surface geological map of the area by defining different rocks units in terms of their significance in petroleum exploration.

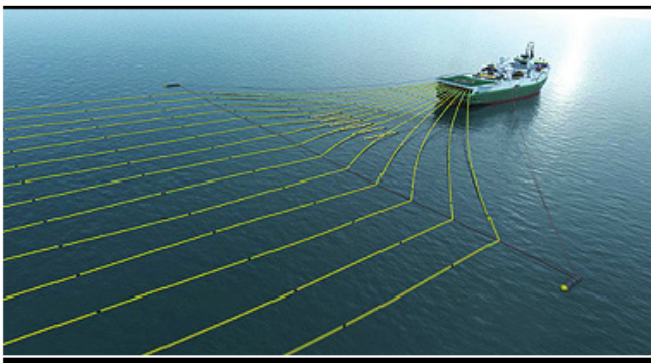
Seismic Data

Seismic data is acquired by sending the soundwaves into the ground and mapping the image of subsurface from the resonance of sound. The sound waves are sent using various methods such as Vibrates, Dynamites, etc. Seismic data is like an ECG of the earth.

Acquired wiggles are stacked to prepare subsurface picture in both, time and depth domains. The primary objective of seismic data interpretation is to confirm the presence of hydrocarbon trap (container).



Onshore Seismic Data Acquisition


Offshore Seismic Data Acquisition

On-Shore

On-shore is referred to the areas which are on land.

Offshore

Offshore is referred to the areas in the sea. Sea areas usually with depths of 1,000 feet or more are called shallow offshore areas whereas the deep-water areas are called deep offshore area.

Dry Well

Dry well is the one that does not encounter hydrocarbons or does not economically produce hydrocarbons.

Injection Well

A newly drilled well or an existing production well is converted into injection well to inject the water or gas into a developed field reservoir to increase the pressure at downhole for maintaining or increasing production.

Value Assurance Process

An important element of development phase is the preparation of the Field Development Plan (FDP), which requires input from various experts and disciplines such as geoscientists, geophysicists, reservoir engineering, drilling, engineering, projects and finance/economics. These inputs provide information as to how much additional seismic data is to be captured, how many additional wells are to be drilled or the size of the infrastructure to be built, etc. It is important to note that it is not necessary to drill all the development wells and infrastructure in one go. These activities may be carried out in piecemeal, as in many cases the input available with the disciplines is not conclusive. Therefore, drilling too many wells and building an oversized infrastructure could lead to waste of resources and erosion of economic value. Consequently, an economic evaluation is performed based on the input. Thereafter, a multi discipline team headed by an experienced manager reviews all the inputs & economic evaluation and comes up with an optimized FDP. This process is called Value Assurance Process. The process is not limited for FDP preparation but is also performed at each stage of field development in later part of field production life.

Farm-in/Farm-out Agreement

This agreement is used when a company being the working interest owner in an Exploration License or D&P Lease would like to sell and transfer its working interest to another company. The company which is transferring its working interest is called the Farming-out party and the company acquiring that working interest is called the Farming-in party. The agreement used for this transaction is called Farm-in/Farm-out Agreement. It contains clauses related to selling price, rights and obligation of each party and the effective date, etc.

Assignment Agreement

The GoP grants the rights in the Exploration License/D&P Lease and the transfer of rights is also subject to the GoP's approval. The Farm-in/Farm-out agreement is between the seller and the buyer of the working interest. Therefore, to make the transfer of rights in Exploration License/D&P Lease effective, the government and Farm-in/Farm-out parties execute an Assignment Agreement.

Joint Operating Agreement (JOA)

The Joint Operating Agreement in oil and gas industry is an underlying contractual framework of a JV. The JOA is a contract where two or more parties agree to undertake a common task to explore and exploit an area for hydrocarbons. The parties to the agreement can be broadly classified as operator and non-operator(s).

The operator is the one who is responsible for day-to-day management and operation of the field. It is usually a single party with the highest interest in the agreement. It is also common though to have a designated operator who is a minority to the agreement. Though the operator is entitled to full control over the operations, it usually does not receive any remuneration. The main duty of the operator is to plan the activities carefully to increase profitability of the operations. However, it is not liable for any loss of production or revenues because of its decisions except in cases of gross negligence and/or willful misconduct.

A typical JOA will include the following:

1. Duration of the agreement
2. Parties to the agreement
3. Parties participating interests
4. Scope of work
5. Exclusive operations
6. Designated operator
7. The Joint Operating Committee
8. Cost control and contracting
9. Hydrocarbon allocation
10. Hydrocarbon lifting and disposal
11. Transfer of interests
12. Withdrawal from JOA
13. Liabilities
14. Decommissioning
15. Default
16. Dispute resolution
17. Accounting procedure

Accounting Procedures

Accounting Procedures is a very important part of the JOA and is based on the principle that there shall be 'no gain, no loss' to any party to the JOA. It deals with several issues including, but not limited to, how cash will be provided to the operator by the non-operators to fund the joint operations (commonly known as Cash Calls) and the timing and content of settlement statements and billings. It also includes exchange rate benchmarks relating to payments in foreign currency, timing and procedures for audits and cost allocation rules and the management of materials and equipment, etc.

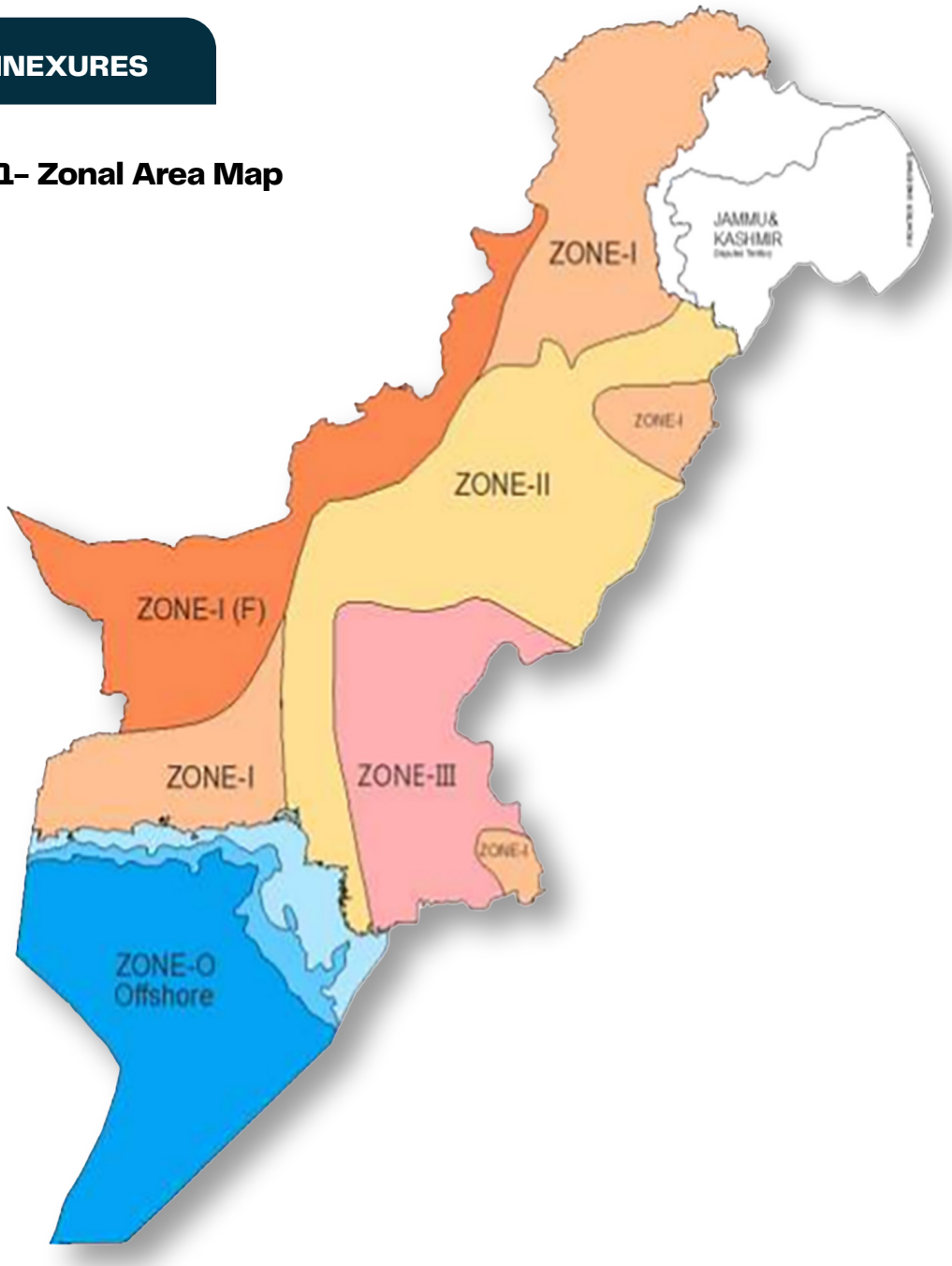
In general, the primary goal of accounting procedures is to detail the steps to be followed by the operator when allocating the costs relating to joint operations as well as stating the costs incurred for the non-operators.

18 EXPLORATION SPECIFIC TERMINOLOGY

Term	Definition	Use
Finding Cost	Total cost spent to discover and prove new hydrocarbon reserves, usually expressed in $/barrel. Includes seismic, drilling, and exploration expenses.	Used by companies to assess the efficiency of their exploration activities.
Lifting Cost (Operating Cost)	Cost to extract a barrel of oil/gas once reserves are discovered. Covers field operations, labor, fuel, and maintenance.	Tracked by all E&P companies to measure operational efficiency.
Reserve Replacement Ratio (RRR)	Ratio of new proved reserves added to the volume produced in the same year. An RRR > 1 means reserves are growing.	Reported in investor presentations; DGPC may use it for performance assessment.
Reserve Life Index (RLI)	Indicates how long current reserves will last at the current production rate. Calculated as total reserves ÷ annual production.	Helps investors understand field longevity
Reserve Split Ratio	Division of discovered reserves or production between the operator and the government (under PSCs or PCAs).	Key in PSC blocks awarded offshore under DGPC rules.
Exploration Cost per Barrel	Total exploration costs divided by total discovered reserves. Higher in difficult terrains or frontier areas.	Used to compare block-level exploration efficiency
Development Cost	Cost of building facilities, wells, pipelines, and infrastructure to produce discovered reserves.	Submitted to DGPC as part of Field Development Plans (FDPs).
Unit Technical Cost (UTC)	Total cost per barrel including finding, development, and lifting cost. Indicates overall technical efficiency.	Used by management for project approval decisions and benchmarking.
Break-even Oil Price	The minimum oil price at which a project becomes profitable (NPV = 0 or IRR = hurdle rate).	Important for marginal fields or enhanced oil recovery projects in Pakistan.
Working Interest	Percentage share of a company in a petroleum block. It determines cost liability and share in production.	Mentioned in the PCA
Net Revenue Interest (NRI)	Actual share of production revenue received by a company after deducting royalty and government take.	Used in financial models to project company earnings from a field.
Seismic and G&G Costs	Costs for geological studies, seismic surveys (2D/3D), and subsurface mapping before drilling.	First step in exploration; DGPC monitors these in exploration phase budgets.
Dry Hole Cost	Cost incurred on a well that turns out to be non-commercial or fails to find hydrocarbons.	Treated as exploration write-offs in accounts.

18 ANNEXURES

Annexure 1– Zonal Area Map



FURTHER READINGS

1. Pakistan's Petroleum Policies, Petroleum Rules, Model PCA and PSC; http://mpnr.gov.pk
2. The Association of International Energy Negotiators; https://www.aien.org
3. Pakistan Petroleum Information Service;
4. Pakistan Energy Yearbook

Annexure 2– Sample Pricing

Gas Pricing:

WELL HEAD GAS PRICE ILLUSTRATION AS PER PRICING PROVISIONS OF POLICY 2012 FOR ZONE III

	$/BBL
A. Weighted average imported Crude Oil C & F Price (Assumed RCP)	**140**
Floor Price C & F	**10**
Ceiling Price	**110**

B. Apply sliding scale discounts to C&F crude oil price after floor & upto ceiling.

US$/BBL	Applicable % of C&F Price	US$/BBL
0 to 30 100% 30	100%	30
Above 30 to 50	Plus 50% of incremental increase	10
Above 50 to 70	Plus 30% of incremental increase	6
Above 70 to 110	Plus 20% of incremental increase	8
Applicable C&F Price	(A+B+C+D)	54
Marker Price Onshore Zone III	64.91% of applicable C&F price	$ 35.051

Conversion Factor * assumed (MM Btu/bbl)	5.7
Zone III producer price for pipe line quality specification gas in US$/MMBtu	6.15

Oil Pricing:

Crude and Condensate Price
based on last week of June 202X

Crude Oil Price Calculation:

Basket Price	
Oman	76.46
Dubai	76.45
Average Price	**76.46**
Adjustments:	
Marine Transportation	1.75
Eastern Hemisphere	2.55
Yield Differential	2.90
Price Before windfall levy	83.66
Windfall levy	15.28
Crude Price	**68.38**

Consendate Price Calculation:

Senipha	61.31
Adjustments:	
Yield Differential	1.50
Price Before windfall levy	62.81
Windfall levy	7.98
Condensate Price	**54.83**

Annexure 3 – Calculation of Taxable income and liability is illustrated

XYZ Company
Tax Year XXX
Tax Computation for the year 20XX

Computation of Income

Profit Or Gains From The Exploration And Production Of Petroleum Taxable Under part I Of The Fifth Schedule To The Income Tax Ordinance 2001

		40%
		Rs '000
Profit/(loss) before taxation as per accounts		xxxxxxx
Add:	Accounting depreciation	xxxxx
	Amortisation of Decommissioning Cost	xxxxx
	Provision for decommissioning costs – unwinding of discount	xxxxx
	Provision for decommissioning costs exchange loss/(Gain)	(xxxxx)
	Revision in estimates due to change in due to revision in decom estimates	xxxxx
	Amortisation of exploration and development cost	xxxxxx
	Provision for stores and spares	xxxx
	Provision for Workers Welfare Fund (WWF)	xxxx
	Tax gain/(loss) on disposal of fixed assets	xxxx
		xxxxxxx
Less:	Exploration and development costs & evaluation assets	(xxxxxxx)
	Tax depreciation	(xxxx)
	Exchange gain/(Loss) on financial assets – exempt	(xxxx)
	Accounting profit/(loss) on disposal of fixed assets	(xxxx)
	Decommissioning costs allowable under Rule (4A) of Part I of Fifth Schedule to the 2001 Ordinance	(xxxxx)
		(xxxxxxx)
Total income before depletion allowance		xxxxxxx
Less:	Depletion allowance	(xxxxxx)
Less:	Set off of loss	–
Total income/(loss) before WWF		xxxxxxx
Less:	WWF	(xxxxx)
Total income/(loss) for the year excluding such part thereof to which paragraph (D) of the Part V of the First Schedule of the 1979 Ordinance / section 169 of the 2001 Ordinance applies		xxxxxxx

XYZ Company
TAX COMPUTATION FOR YEAR ENDED JUNE'XX
TAX YEAR 20XX

Computation Of Tax Liability And Tax Payable / (Refundable)

a. Tax liability and tax payable/(refundable)

	40%
	Rs '000

i. Tax on profits or gains from exploration and production of petroleum assessable under Part I of the Fifth Schedule to the Income Tax Ordinance, 1979 (1979 Ordinance)

Profits or gains/(loss) as per attached "Computation of profits or gains from exploration and production of petroleum and income from other business"	XXXXXXX
Payments to the Government – Royalty	–
Profits and gains before payments to the Government	XXXXXXX
	Rupees
40% of profits or gains after deduction of royalty	XXXXXXX

18 Abbreviation

AFRA – Arrange Freight Rate Assessment

AIEN – Association of International Energy Negotiators

AIPN – Association of International Petroleum Negotiator

APL – Attock Petroleum Limited

D&P Lease – Development and Production Lease

EWT – Extended Well Testing

FDP – Field Development Plan

GO – Gas & Oil

JOA – Joint Operating Agreementt

NPV – Net Present Value

OGRA – Oil and Gas Regulatory Authority

OPEC – Organization of the Petroleum Exporting Countries

PCA – Production Concession Agreement

PSA – Production Sharing Agreement

PSO – Pakistan State Oil

PGL – Parco Gunvor Limited

PGHL – Provincial Government Holding Company

SNGPL – Sui Northern Gas Pipelines Company Limited

SSGC – Sui Southern Gas Company Limited

WEPL – Wafi Energy Pakistan Limited

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Disclaimer

This is the updated version of first industry-specific guideline issued by the Professional Accountants in Business (PAIB) Committee of the Institute of Chartered Accountants of Pakistan. The objective is to provide guidance and a head start to fresh Chartered Accountants willing to join the Exploration & Production industry. The information contained in the guideline is based on the professional experience of the author and reviewers as well as the information collected from other professionals in their respective areas of expertise within the Exploration & Production industry. Although due diligence has been exercised in compiling information, the practices may vary across companies operating in the sector. The Institute does not accept any responsibility for any loss to any person arising out of acting on the information contained in the guideline. The readers are requested to inform the PAIB Committee of the Institute about errors/omissions, if any, in the guideline for correction in future editions

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