Fundamentals of Oil & Gas Accounting

# FUNDAMENTALS OF OIL & GAS ACCOUNTING

## 6TH EDITION

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# Contents

# 1 Upstream Oil and Gas Operations

Oil and gas industry operations are generally classified as being either upstream or downstream. **Upstream** oil and gas operations include exploration, acquisition, drilling, developing, and production activities and are frequently referred to as exploration and production activities or E&P activities. Traditionally, downstream operations were defined to include transportation, refining, marketing, and distribution activities. However, recently it has become commonplace to further delineate downstream operations as being either midstream or downstream. Under this classification, **midstream** activities generally include shipping and storage of oil and gas away from the point of production, while **downstream** refers to refining, marketing, and distribution of processed products. **Integrated oil and gas companies** are involved in upstream activities as well as midstream and/or downstream activities, whereas **independent oil and gas companies** are involved primarily in only upstream activities.

The US Securities and Exchange Commission (SEC) *Reg. S-X* details the requirements relating to content and format of financial statements and reports filed by publicly traded companies in the United States. It specifically requires that financial statements be prepared in accordance with US Generally Accepted Accounting Principles (GAAP), with few exceptions. *Reg. S-X Rule 4-10*, "Financial Accounting and Reporting for Oil and Gas Producing Activities," details the specific accounting rules and regulations that apply to companies engaged in "oil and gas producing activities." *Reg. S-X Rule 4-10* first appeared in *Reg. S-X* in 1978 and is continuously updated as needed.

The starting point for any discussion of upstream accounting and reporting is to understand specifically which activities are classified as oil and gas producing activities (as opposed to midstream or downstream activities). The SEC defines oil and gas producing activities in *Reg. S-X Rule 4-10*. Since *Reg. S-X Rule 4-10* governs upstream oil and gas financial accounting and reporting for public companies in the United States, understanding the SEC definition of oil and gas producing activities is critical. According to the SEC definition, oil and gas producing activities include the following:

- The search for crude oil, including condensate and natural gas liquids in their natural states and original locations.

ring liquid and gaseous hydrocarbons. In some instances, heat and pressure are actually applied **in situ** (i.e., heating the oil shale while it is still underground and then pumping any resulting liquid to the surface). In other operations, the heat and pressure are applied to the oil shale or tar sand after it has been removed from the ground.

Production from coal beds involves extraction of natural gas (primarily methane) from coal beds. It has been known for centuries that natural gas exists in underground coal mines. As a matter of fact, the first production of gas from coal beds resulted from the need to vent methane gas from coal mines for safety purposes. Coal beds have very low permeability, and the methane exists in a near-liquid state. When the coal bed is fractured, the channels that are created allow the methane to flow and be captured in steel-lined holes. These holes are typically quite shallow, ranging from around 300 feet to 5,000 feet in depth. In recent years, the extraction of natural gas from coal beds has become commonplace, especially in the United States, Canada, and Australia.

Nonconventional operations have resulted in the ability to extract petroleum resources that previously were not technologically producible. However, nonconventional operations, including production shale oil and gas and production from oil shale, tar sands, and coal beds, are expensive. For example, oil from shale formations costs $50 to $100 per barrel to produce, while conventionally produced oil from the Middle East costs $10 to $25 per barrel.[6]

## Exploration Methods and Procedures

Traditional oil and gas exploration involves the work of geoscientists using a variety of geological and geophysical (G&G) techniques to identify areas far beneath the earth's surface that may contain petroleum reserves. Geological methods rely on the identification of rocks and minerals on or near the surface and the understanding of the environments in which they were formed. Geological studies, which involve surface studies, involve any number of methods, depending on the size of the area being examined. These methods may include the use of aerial photography, satellite imaging, imaging radar, and topographical and geological mapping. Such methods are aimed at gathering data about surface features that can be used to make inferences regarding the potential existence of petroleum-bearing subsurface formations.

Geophysical methods, which involve subsurface studies, are aimed at locating and detecting the presence of subsurface structures and determining their size, shape, depth, and physical properties. These methods may be used to identify the presence of certain physical characteristics that are indicative of oil and gas reservoirs. Geophysical methods include gravitational studies, magnetic and electromagnetic evaluation, and seismic studies.

Seismology is one of the most important tools in oil and gas exploration today. These studies provide detailed information about subsurface structures by recording the reflection of sound waves on subsurface formations. Innovations in seismology, such as 3-D seismic studies, have significantly increased drilling success rates. The use of seismic studies has extended beyond exploration for oil and gas, with seismic studies now being used extensively in field development and production planning. Time-lapse, or 4-D seismic, involves repeating a series of 3-D seismic surveys over time in order to monitor how certain reserwell maintenance facilities. These fixed platforms, which are very expensive, are usually made from steel or concrete, depending on their location.

The drilling operations of an offshore rig are similar to those of onshore rigs, with the exception of specialized technical adaptations that have been made to deal with the hostile marine environment. In addition, directional drilling is commonly used offshore, since that technique can reach thousands of feet away from the platform. This allows the drilling of multiple wells (as many as 40 or more) from the same platform.

In addition to production from fixed platforms, offshore production may also be achieved via subsea completions. Subsea completions are subsea satellite wells that are situated on the ocean floor (as opposed to being located on a production platform). The production from these wells is moved directly to platforms, floating production/storage/offloading vessels (FPSOs), or to the shore, where it is processed and stored pending sale. Subsea completions are commonly used in areas where it is not feasible to access the production location from a production platform and in situations where the economics do not support the cost of a platform.

Many industry experts predict that the future of the offshore industry is in deepwater and ultra deepwater areas. **Deepwater** areas are defined as outer continental areas where water depths are 450–1,499 meters (about 1,476 to 4,918 feet) and **ultra deepwater** areas are defined as having water depths of 1,500 meters (about 4,921 feet) or greater. Note that deepwater wells extend several thousand feet further into the rock below the ocean floor. Royal Dutch Shell discovered the Stones field in 2005. The Stones field is located 200 miles southwest of New Orleans. The Stones field production facilities are the deepest in the world. Production water depths are approximately 9,500 feet, and the reservoir is located approximately 26,500 feet below sea level. The cost of drilling in deepwater and ultra deepwater is extremely high and the risks are extremely great.

## Recovery Processes

Several types of production processes may be employed in order to move the oil or gas from the reservoir to the well. These production processes are commonly divided into three types of recovery methods: primary, secondary, and tertiary. These recovery techniques are used in conventional production as well as production from shale formations.

The initial or **primary recovery** of oil and gas is either by natural reservoir drive or by pumping. Natural drive occurs when sufficient water or gas exists in a reservoir under high pressure to provide the energy needed to drive the oil to the wellbore. If insufficient natural drive exists, the oil may be pumped to the surface using a beam pumping unit.

When the maximum amount of oil and gas has been recovered by primary recovery methods and the reservoir pressure has been largely depleted, secondary recovery methods may be instituted. **Secondary recovery** consists of inducing an artificial drive into the formation to replace the natural drive. The most common method is waterflooding, which involves injecting water under pressure into the formation to drive the oil to the wellbore.

| | |
|---|---|
| 12310-302 | Offdevdrl—Wellhead Equipment |
| 12310-303 | Offdevdrl—Subsurface Equipment |
| 12310-330 | Offdevdrl—Miscellaneous Nonoperating Equipment |
| 12310-399 | Offdevdrl—Tangible JO Share |
| 12310-902 | Offdevdrl—Account Transfers |
| **12311-000–12311-999** | **OFFSHORE FACILITIES (WELLS-IN-PROGRESS)** (Many of the individual accounts are similar to accounts for offshore development drilling.) |
| **12312-000–12312-999** | **OFFSHORE WORKOVER (WELLS-IN-PROGRESS)** (Individual accounts are similar to accounts for offshore development drilling.) |
| **12313-000–12313-999** | **OFFSHORE RECOMPLETION (WELLS-IN-PROGRESS)** (Individual accounts are similar to accounts for offshore development drilling.) |
| **12314-000–12314-999** | **OFFSHORE DEVELOPMENT WELL PLUG AND ABANDONMENT (OFFDEVPA) (WELLS-IN-PROGRESS)** |
| 12314-043 | Offdevpa—Survey, Road, Location, Damage |
| 12314-046 | Offdevpa—Mobile and Demobile |
| 12314-055 | Offdevpa—Completion Rig |
| 12314-061 | Offdevpa—Water |
| 12314-063 | Offdevpa—Lost/Dam Rental Equipment |
| 12314-064 | Offdevpa—Equipment Rental & Service |
| 12314-067 | Offdevpa—Mud & Chemicals |
| 12314-068 | Offdevpa—Completion without Fluids |
| 12314-070 | Offdevpa—Drilling Bits |
| 12314-071 | Offdevpa—Perforation |
| 12314-074 | Offdevpa—Cement & Cement Service |
| 12314-078 | Offdevpa—Well Log/Cased Hole |
| 12314-082 | Offdevpa—Fishing Tools & Service |
| 12314-083 | Offdevpa—Wireline Services |
| 12314-088 | Offdevpa—Tubular & Equipment Repair |
| 12314-089 | Offdevpa—Tubular Inspection Services |
| 12314-091 | Offdevpa—Stimulation |
| 12314-095 | Offdevpa—Trucking, Land Transportation |
| 12314-096 | Offdevpa—Boat, Water Transportation |
| 12314-097 | Offdevpa—Helicopter, Air Transportation |
| 12314-101 | Offdevpa—Company Labor |
| 12314-103 | Offdevpa—Payroll Burden |
| 12314-105 | Offdevpa—Contract Labor |
| 12314-107 | Offdevpa—Consultants |
| 12314-108 | Offdevpa—Meals/Entertainment |
| 12314-109 | Offdevpa—Other Employee Expense |

but where significant expenditures are necessary in order to actually produce them. The definition of undeveloped reserves appears in *Reg. S-X Rule 4-10(a)(31)*.

> *Undeveloped oil and gas reserves are reserves of any category that are expected to be recovered from new wells on undrilled acreage, or from existing wells where a relatively major expenditure is required for recompletion.*
>
> i. *Reserves on undrilled acreage shall be limited to those directly offsetting development spacing areas that are reasonably certain of production when drilled, unless evidence using reliable technology exists that establishes reasonable certainty of economic producibility at greater distances.*
> ii. *Undrilled locations can be classified as having undeveloped reserves only if a development plan has been adopted indicating that they are scheduled to be drilled within five years, unless the specific circumstances, justify a longer time.*
> iii. *Under no circumstances shall estimates for undeveloped reserves be attributable to any acreage for which an application of fluid injection or other improved recovery technique is contemplated, unless such techniques have been proved effective by actual projects in the same reservoir or an analogous reservoir, as defined in paragraph (a)(2) of this section, or by other evidence using reliable technology establishing reasonable certainty.*

Recall the definition of proved reserves provided that adjacent undrilled portions of a reservoir could be included in the proved area of the reservoir if it was determined with reasonable certainty that the area was a continuous portion of the reservoir. By definition, such an undrilled area is undeveloped, and any proved reserves estimated to be present in that area are classified as PUD reserves. The definition of PUD reserves requires that, in order to be classified as PUD, there must be a plan to develop those reserves within a five-year period. Reserves that will take longer than five years to develop can be included, but the specific circumstances that result in the delayed development (beyond five years) must be explained and justified. It is very important to note that if undeveloped reserves cannot be classified as PUD, then they *cannot* be classified as proved; they are unproved.

Given the significance of proved reserves in both disclosures and in financial accounting, the classification of undeveloped reserves as being PUD reserves is of critical importance. This is why the SEC requires that companies provide detailed information explaining the progress in moving PUD reserves to the PD reserve classification. SEC issued a *Compliance and Disclosure Interpretation* of this definition aimed at clarifying and aiding in evaluating whether reserves whose development may extend past five years should be included as PUD. According to the *Interpretation*, consideration should be given to the following:

1. The company's level of ongoing significant development activities in the area
2. The history of completing developments for comparable long-term projects
3. The amount of time the underlying leases have been maintained without development activities
4. The history of the company in following previously adopted development plans

c. Are there any firm plans for drilling?

d. Is the passage of time an indication that the company has reassessed its interest in the property?

Dry holes and negative G&G information would normally indicate that the property has become impaired. If neither drilling nor production is in progress at the end of the primary term, the lease terminates, and the leasehold costs must be written off. Therefore, a property may also be impaired if the end of the primary term is near and no firm plans for drilling have been established.

At any given time, it is possible that a company may have hundreds of unproved properties. This is especially true for operations in the United States, where individual leases typically cover a relatively small area. Assessing each and every lease for impairment annually would require a substantial commitment of time and resources. Accordingly, the FASB permits companies to classify their unproved properties into one of two categories:

1. Those properties whose cost is individually significant
2. Those properties whose cost is not individually significant

According to *ASC 932-360-35-11*:

> *Impairment of individual unproved properties whose acquisition costs are relatively significant shall be assessed on a property-by-property basis, and an indicated loss shall be recognized by providing a valuation allowance. When an entity has a relatively large number of unproved properties whose acquisition costs are not individually significant, it may not be practical to assess impairment on a property-by-property basis, in which case the amount of loss to be recognized and the amount of the valuation allowance needed to provide for impairment of those properties shall be determined by amortizing those properties, either in the aggregate or by groups, on the basis of the experience of the entity in similar situations and other information about such factors as the primary lease terms of those properties, the average holding period of unproved properties, and the relative proportion of such properties on which proved reserves have been found in the past.*

In international operations, contract areas tend to be quite large and are frequently expensive to obtain, while domestic operations are characterized by a large number of relatively less expensive leases. Companies may treat each international contract area as individually significant, since the costs are large and there are fewer properties. Domestically, the sheer number of properties may make the cost of each property in itself insignificant.

*ASC 932-360-35* does not provide any guidance for companies in identifying individually significant properties. According to the *2011 PricewaterhouseCoopers Survey of U.S. Petroleum Accounting Practices*, a common approach is to base the classification on the actual cost of the property.[1] For example, properties with an individual cost of $1,000,000 or more might be classified as individually significant, and all properties with a cost below $1,000,000 might be treated as not being individually significant. The SEC has issued

*LEASE C*

| | | |
|---|---|---|
| Lease impairment expense ($44,080 × 30%) . . . . . . . . . . . | 13,224 | |
| Allowance for impairment . . . . . . . . . . . . . . . . . . . . . . . . | | 13,224 |

*LEASE D*

| | | |
|---|---|---|
| Lease impairment expense ($71,550 × 20%) . . . . . . . . . . . | 14,310 | |
| Allowance for impairment . . . . . . . . . . . . . . . . . . . . . . . . | | 14,310 |

g. Early in the third year, Tawhoe Oil Company abandoned Lease C and Lease D.

**Entries**

*LEASE C*

| | | |
|---|---|---|
| Surrendered lease expense . . . . . . . . . . . . . . . . . . . . . . . . . . | 30,856 | |
| Allowance for impairment . . . . . . . . . . . . . . . . . . . . . . . . . . | 13,224 | |
| Unproved property . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | | 44,080 |

*LEASE D*

| | | |
|---|---|---|
| Surrendered lease expense . . . . . . . . . . . . . . . . . . . . . . . . . . | 57,240 | |
| Allowance for impairment . . . . . . . . . . . . . . . . . . . . . . . . . . | 14,310 | |
| Unproved property . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | | 71,550 |

h. Also in the third year, Tawhoe Oil Company discovered proved reserves on Lease A and Lease B.

**Entries**

*LEASE A*

| | | |
|---|---|---|
| Proved property . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 15,405 | |
| Allowance for impairment . . . . . . . . . . . . . . . . . . . . . . . . . . | 5,135 | |
| Unproved property . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | | 20,540 |

*LEASE B*

| | | |
|---|---|---|
| Proved property . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 36,980 | |
| Unproved property . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | | 36,980 |

## Land Department

The land department of an oil company usually is responsible for property acquisition and property administration. The exploration and legal departments are also concerned with these functions. The exploration department is responsible for recommending property acquisition, retention, and development or abandonment. The legal department conducts title examinations and title litigation and approves or prepares any legal documents involved.

The land department acts on information obtained from the exploration department's activities and from land department scouts in acquiring properties. Subscription services portion of the well did not add to the value of the sidetracked hole that was completed. Some companies, on the other hand, choose to capitalize the entire cost of the drilling, since the entire drilling effort was necessary in order to find new proved reserves.

Situation D depicts a situation in which the exploratory well was dry at the target depth but was plugged back and completed at a shallower depth. In practice, many argue that the incremental costs of drilling beyond the depth at which the well was completed should be charged to dry-hole expense. The costs of drilling to the completed depth along with completion costs are capitalized. Similarly, in situation E, it can be argued that the incremental costs of drilling beyond the successful target depth to a dry, unproved horizon should be expensed.

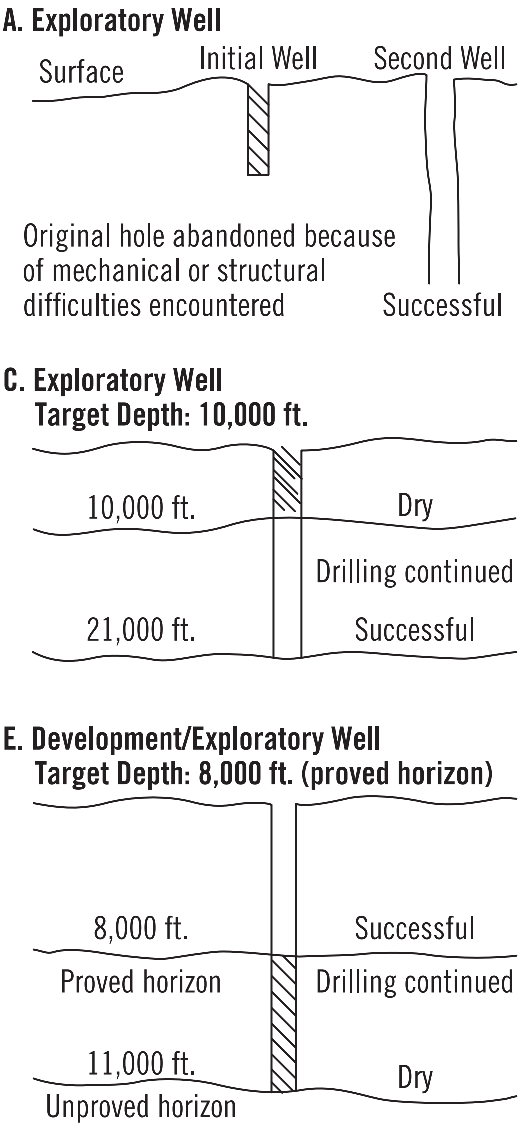


**Fig. 6–4. Special drilling situations**