

**RESERVOIR MODELING CONSORTIUM  
PROGRESS REPORT, March 1, 2005**

**TITLE OF PROJECT:** PICTURE OF THE US PETROLEUM UPSTREAM  
INDUSTRY SINCE EARLY 1980'S.

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**OBJECTIVE:** The objective of this study is:

1. Analyze the activities of the US upstream business since the early 1980's
2. Identify any existing trends in the US upstream sector
3. Analyze 4 US companies – Apache, Anadarko, Chesapeake, and Devon Energy

**PROJECT STATUS:** Reviewed trends in production, prices, M&A's, etc for the US upstream industry since early 1980's.

**FUTURE WORK:** This project is completed.

## 1. INTRODUCTION

The oil and gas industry has been noticed to have a cyclical nature with periods of high activity followed by decline periods. The inception of the industry is attributed to Colonel Edwin L. Drake who discovered oil in the U.S. in 1859<sup>1</sup>. The oil market went from being a predominantly U.S. dominated market with majority of production and consumption occurring in the U.S. to an increasingly global entity. Since the first discovery, the industry has undergone many changes and transitions; we have observed the Rockefeller era and its collapse in 1911, the formation of OPEC in 1960, three major oil shocks, and presently a period of boom with high crude prices<sup>2</sup>. The changes and volatility in the market as well as its cyclical nature has had its effect on the U.S. upstream petroleum industry. Several trends have been observed in the industry since the 1980's. The objective of this report is to present these trends and evaluate the occurrences and paint a picture of the U.S. upstream petroleum industry over the past 25 years. This report will present a general overview of the U.S. petroleum industry as a whole as well as tracking the strategies and performances of a few U.S. independents primarily focused on upstream exploration and production activities.

The U.S. upstream petroleum industry has been restructured and several changes have been observed since the early 1980's to the present to illustrate trends in the industry. What highlighted the interest in these trends was the annual *Oil and Gas Journal (OGJ)* series ranking the leading publicly owned U.S. firms and U.S. based operating subsidiaries of foreign companies. The list includes all major oil and gas companies based in the U.S. and non majors with reserves and production in the U.S. The primary ranking of the companies on the list is based on total assets indicating the size of the firm. Other rankings are provided for the companies on the list based on additional parameters such as revenues, net income, capital and exploratory spending, U.S. and worldwide production and reserves, and number of wells drilled, etc<sup>3</sup>.

However we noticed one big change in this list which started in 1983 based on the previous year's statistics which was the declination in the number of companies on the list. Initially, the list was constricted to *OGJ* 400 with 400 companies, later changing to

*OGJ* 300 in 1991, and finally *OGJ* 200 in 1996. The last edition of the *OGJ 200* special report dated September 13, 2004 had only 146 companies listed. Some key changes in the list occurred from several company's sale of U.S. producing properties, liquidation, privatization and bankruptcies. This observation generated an interest into the inner workings of the traditional public U.S. Exploration & Production company. Four companies were picked Apache, Anadarko, Chesapeake and Devon energy which exhibited consistent and continued growth compared to other companies which were either bought out, liquidated or went bankrupt. We will be observing the different corporate strategies of these companies to see if they are inline with the U.S. upstream petroleum industry as a whole and seeing if there are similarities and difference among each. In essence, what are individual companies doing? Additionally, are there any trends in behaviors, activities and strategies?

## **2. U.S. OIL PRODUCTION AND RESERVES**

The statistics for U.S. oil production indicate that over 50% of ultimate reserves have been recovered. The peak for the U.S. oil resource was a crucial event which transpired in 1970. King Hubbert, a research geophysicist with U.S. Geologic survey, predicated the U.S. oil production peak in 1956 using a simplified production model. The Hubbert oil depletion model assumes that the rate of production increase would be equal to the rate of production decline. The Hubbert Curve generated is a fit of a symmetric production rate to existing historical data to give an area under the curve yielding the ultimate oil recovery,  $Q_{\infty}$ . The two values for ultimate recovery used to generate the curve were 150 billion barrels and 200 billion barrels respectively. These values were obtained from educated geologic estimates. However, it was the 200 billion barrels estimate that matched the actual peak oil production rate in 1970. It is proposed that Hubbert's original oil forecast was probably based on U.S. lower 48; thereby excluding Alaska and offshore. A recent fit for the U.S. oil production rate for the lower 48 and lower 48 including Alaska and offshore is shown in **Fig 1**. Using a least squares curve fitting method to match the historical oil production data to the Hubbert Model, yields the values for ultimate recovery of 202 and 234 billion barrels for the U.S. lower 48 and U.S. lower 48 including Alaska and offshore respectively. Alaskan oil production became significant in

1977 with initiated production from the Prudhoe Bay field, the largest field in the U.S. Alaska's oil production resulted in a temporary reversal of the declining U.S. oil production trend. Nevertheless, the oil production in this area also reached its peak and started on a steady decline in 1989. Another important aspect of U.S. oil production is its offshore production which started in 1954. Technological developments have fostered developments in deeper waters and this has contributed to increased oil production coming from offshore sources. **Fig 2** obtained from the EIA further elaborates U.S. oil production by geographical location (48 states and Alaska) and by site (onshore and offshore).<sup>4</sup>

The Hubbert Curve, in general, presents a fairly good and accurate model for oil resource depletion. For the U.S., the historical oil production rates closely matched with the Hubbert curve at the earlier years before the peak production; however, after the peak we observe slight deviations from curve. Some of the events yielding these deviations couldn't have been foreseen by Hubbert when he made the forecast, such as oil production in Alaska and offshore. Also, events such as the Arab oil embargo and other external factors ranging from political and economical factors to exploration policies account for deviations from the Hubbert Model.<sup>5</sup>

Plotting oil production for Continental U.S. excluding Alaska and offshore with the least squares fitted Hubbert Curve, we obtain a very a more accurate match. This match is shown in **Fig 3**. The resulting ultimate recovery value given by the area under the curve is 171 billion barrels.

Ever since the peak, we have observed a declining trend in oil production rate in the U.S. The overall U.S. oil production rate has declined consistently since 1970 in spite of technical innovations, step change technologies, enhanced oil recovery mechanisms, and diversion into Alaska and deeper offshore waters, which has helped in recent slight increases in oil production. However, as a whole, these techniques do not offset the overall downward trend of U.S. oil production rate.

U.S. oil reserves peaked at the end of 1970 at a value of 39 billion barrels. Incidentally, this time period also corresponds with the peak oil production rate. Since the oil reserve peak in 1970, year end reserves values have been on a decline. This trend is illustrated in **Fig 4**. **Fig 5** shows a graph of year-end proved oil reserves with oil production over time. The combined year end oil reserves and oil production decline yields a situation where reserve additions and revisions play a significant role. It is interesting to notice that in recent times, we observe a deviation from the reserve declination trend showing an upward movement of year end oil reserves starting in the late 90's. Commerciality is a big factor in classifying reserves as proved; therefore, the price of oil has an effect on the end of year reserve value. This among other factors such as technological advancements is a contributing factor to the recent curtailment of the year end oil reserves decline.

The U.S. oil year end reserves peak also corresponds to the peak in annual reserves addition shown in **Fig 6**. This peak matches up with the discovery of the Prudhoe Bay field in Alaska, which had a significant impact on the U.S. oil business as a whole. This year, 1970 represents the largest amount of oil reserves ever added in one year and it increased the year end reserves by approximately 10 billion barrels. U.S. oil reserve additions since the early 1980's don't show any unique trend noticed from the yearly fluctuations. However, in general the yearly oil reserve additions have remained in a range from a low value of 0.4 to a high value of 3.7 billion barrels.

The reserve replacement rate is an indicator demonstrating the success rate at which the exhaustion of a resource is being delayed. **Fig 7** shows the U.S. oil reserve replacement rate over time. This graph shows a peak in the U.S. percentage of produced oil reserves added at 382% which occurred in 1970 attributed to the Alaskan discovery. From the graph we observe that the pre-peak period exhibited reserve-replacement rates of over 100% on many occasions. This shows that the U.S. oil industry was replacing more than they were producing. Looking at the period from the early 80's to the 90's, we observe that for the most part, reserve-replacement rates were below 100%, indicating the inadequacies of U.S. upstream petroleum industry in replacing its produced reserves. The average oil reserve replacement rate over that period was approximately 84%.

The U.S. oil reserve/production ratio refers to the U.S. oil production life and sustainability. This value changes over time because neither the reserves nor the production rate is constant at any given time. The plot of the U.S. oil annual reserve/production ratio is provided by **Fig 8**. Over the years, the R/P value has indicated that the U.S. has an oil productive life between 9 and 13 years. The early 1980's to the current time show a trend of increasing oil R/P ratio inferring the increase in U.S. oil productive life. This trend is occurring consistently with decreasing oil production as well as decreased year end oil reserves on average. The reason for the increasing trend in this ratio is a result of vast deep offshore oil resources. Although, these resources have been discovered, the expense of producing these resources does not allow for adequate recovery. According to Jentsch and Skov, when the oil production peak is reached, “the rate will begin to fall and the R/P ratio will increase as a function of decreased production and the longer life (and more difficult to produce reserves) become the dominant force in R/P determination.”<sup>6</sup>

### **3. U.S. NATURAL GAS PRODUCTION AND RESERVES**

The evolution of U.S. gas production is illustrated in **Fig 9**. From this graph, we observe a trend of increasing gas production rates until the peak in 1973. From the years 1973-1975, the decline in gas production rates is highlighted by the effects of the Arab oil embargo in 1973. The decrease in associated gas production as a result of oil production decline was also a contributing factor to the decline in gas production rates during this period<sup>7</sup>. After 1975, gas production rates stabilized and regained growth until 1979. During this period, congress passed the Natural Gas Policy Act of 1978 essentially decontrolling the price of new unconventional gas. The time period of 1979-1986 is a very interesting period with regards to U.S. natural gas production. Events of this period include the Iranian revolution in 1979 leading to price spikes generating an oil boom, followed by the steady collapse and crashing of the boom yielding a decline in natural gas demand and gas prices, dropping below \$1/MCF. This period is commonly referred to as the “gas bubble” indicating a period of national gas oversupply. Since 1986, the natural gas industry has re-gained strength and we observe a current overall trend of

increase in gas production rates. It is important to notice that the increase observed has not reached and surpassed the peak production experienced in 1973 at a rate of 62 BCF/d.<sup>4</sup>

Natural gas production rate forecasting unlike that of oil, cannot utilize the traditional Hubbert Model having one complete production cycle to effectively and adequately forecast natural gas production rates. Due to fluctuations in natural gas production rates, a modified Hubbert Model was developed by Al-Fattah and Startzman referred to as “multicyclic Hubbert.” This improved model for natural gas incorporates additional cycles to account for “new exploration areas and technology, regulations, economic factors and/or political events.” **Fig 10** provides the graph showing U.S. natural gas production with the multicyclic Hubbert Model. From this figure we observe the U.S. gas production rate over time exhibits at least two cycles<sup>8</sup>.

Several factors are responsible for the current trend of increasing U.S. natural gas production rates. One factor is governmental regulations, firstly, the decontrol of certain new unconventional gas, followed by complete decontrol of all new gas in 1985 opened the door and fostered the increase of natural gas production in the U.S. The development and restructuring of the gas industry also generated a competitive free market environment enabling responsiveness to market forces, while simultaneously inducing industrial efficiencies.

Also contributing to recent natural gas production trend is the impact of unconventional gas in the U.S. These unconventional gases include coal-bed methane, tight gas, gas hydrates and gas shales. In a 2004 *OGJ* article, titled *Major U.S. supply role seen for unconventional gas*, it states that over the last 20 years, unconventional natural gas in the U.S. has grown from “just modest expectations back in the early 1980’s to become one of the dominant forces of gas supply”<sup>9</sup>. Production of unconventional gas gained momentum in the early 1980’s and its contribution is increasing over time. Unconventional gas production trends are illustrated in **Fig 11**. Available statistics from EIA dated in 1998 indicate that unconventional gas production accounted for 23% of total gas production in the U.S. Estimated reserves for unconventional gas are 51.7 TCF, which are

approximately 31% of total U.S. natural gas reserves<sup>10</sup>. Definitely, there is still a lot of potential for these resources in the future. Growth in unconventional gas resources production is inevitable with abundant reserves along with increased knowledge, experience, and technology. The learning curve will come into play and aid in its development.

Growth in natural gas production also stemmed from increased demand and rising environmental concerns. The desire for environmentally friendly energy sources spurred changes in the energy industry and helped surge the natural gas industry to where it is today. This can especially be seen in the electric power industry through the transitioning from traditional coal fired generators to natural gas generators to produce electricity. Now, over 90% of all new power generators built in the U.S. is built to use natural gas as the main fuel<sup>11</sup>.

The future of natural gas in the U.S. is bright with a trend of increasing production. Additionally, there exist three potential sources of natural gas: 1) increases from existing producing areas in U.S., 2) massive deposits of Alaskan gas, and 3) natural gas from the Gulf of Mexico at depths of 5000ft or more<sup>12</sup>.

U.S. natural gas reserves peaked in 1967 at 293 TCF after which it started to decline. The decline slowed down during the period of the 1980's and then picked up and started increasing in the late 90's till present. **Fig 12** shows the plot of U.S. proved natural gas reserves with marketed annual natural gas production over time. The reserve/production ratio is a measure of the adequacy of proved reserves. For natural gas in the U.S., this value peaked at 40 years, then dropped drastically and started on a decline. The decline in R/P ratio was partly due to the development of the gas market. The curve started to flatten out in the 80's to an average value of 9.5. The natural gas reserve/production ratio over time is plotted on **Fig 13**.

#### 4. NATURAL GAS TRENDS AND SIGNIFICANCE

Entering the 1980's, the deregulation of the natural gas market as well as the surge of environmentalism in the U.S. and worldwide generated momentum for natural gas. Natural gas, therefore, came into the spotlight as the new fuel of choice because of the characteristics of being a cleaner energy burning fuel compared to oil and coal. Global warming and emission concerns have helped spur the importance of natural gas and an increase in its usage especially in the electric power generation sector transitioning from traditional coal fired to natural gas electricity generators. Natural gas also provided additional advantages including lower cost and efficiency. The total cost of electric power generation is lowest for natural gas-fired turbines and natural gas combined cycle at \$39.81/KWhr and \$26.69/KWhr respectively compared with \$56.04/KWhr for pulverized coal plant and \$89.43/KWhr for oil fired steam plant<sup>11</sup>.

Natural gas has been steadily gaining importance as a portion of the U.S. and worldwide energy mix. Since the early 1980's natural gas's portion of the energy mix has increased substantially in the U.S. and worldwide. The share of natural gas consumption has increased since the 1980's and EIA forecasts anticipate increased growth in the area of natural gas consumption for the future<sup>10</sup>. This presents a vibrant and opportune market being tapped by upstream petroleum companies in the U.S. As a result, we observe a trend of natural gas gaining ground and overtaking oil in the industry. This gain is illustrated in **Fig 14**. A trend of higher wellhead revenues with respect to natural gas over oil operations is noticed. The new natural gas/oil revenue trend was initiated in 1993, the first occurrence where natural gas revenues were greater than oil revenues. This trend is a contrast from the past where now 37% and 63% of revenues were from oil and natural gas respectively as opposed to 68% and 32% at the start of the 1980's. In essence, upstream petroleum company activity strategies are more focused on natural gas than oil. Exploratory and drilling activities collaborate accordingly as illustrated in **Fig 15 & 16**, where we observe that the U.S. upstream petroleum industry as a whole have more exploratory and drilling activities related to natural gas than oil. EIA statistics for 2003 show that the rig count associated with natural gas activities was 872 compared to 157 for

oil activities. From this, it can be concluded that the companies are going out seeking natural gas fields over oil because they are more profitable.

Natural gas has emerged and become attractive to companies also in regard with its value. Relative to other fuels such as oil and coal, the cost of natural gas operations are lower stimulating the increased interest in natural gas for operators. **Fig 17** is a graph of natural gas/oil price ratio, indicating the relative value of natural gas compared to oil on a \$/BTU basis. In 1976, the natural gas/oil price ratio was 0.4, translating that natural gas was 40% as valuable as oil. This ratio has changed over time, to a peak value in 2001 of 106%. Essentially, this is reiterating the fact that natural gas is becoming the new fuel of choice.

Companies are diverting more into the natural gas market because there is observed growth in the industry fostered by trends of increasing natural gas production rates over time. However, this is not true for oil, because production rates are on a decline and little can be done to re-energize and stimulate growth in the U.S. oil sector. Therefore, increased production in natural gas resources will guarantee that natural gas will continue to play an increasing role toward supply of U.S. energy needs.

## **5. OIL PRICE AND ITS EFFECTS**

Factors that contribute to price levels are supply and demand, external factors such as geopolitical issues (wars, political instability), and market speculations and anticipations. **Fig 18** shows a plot of crude oil and natural gas prices over time. It is noticed there is no real trend in the price levels of oil over time. However, when comparing crude oil and natural gas prices, we observe a “somewhat direct relationship” between the two parameters precluded by a time lag of approximately 3 to 4 years<sup>5</sup>. The price trend is volatile and cyclical with constant ups and downs. The fluctuations in prices are linked to certain key events in the industry. In summary, the oil industry has experienced many shocks in its lifetime from the 1973 Arab oil embargo, the 1979 Iranian revolution, to implementation of OPEC quotas in 1982, to Saudi Arabia’s Netback contracts post 1986 price collapse, the Kuwait crisis in 1990, September 11 terrorist attack on the U.S. in 2001, and the war in Iraq in 2003. Over the past 25 years, major dips and spikes have

been a result of political issues and occurrences. However, in recent times, the discrepancy between worldwide demand and supply is playing a huge effect on the volatility of prices today<sup>2</sup>.

The upstream petroleum sector can be impacted unfavorably by political and economic conditions due to several economic uncertainties which in turn affect oil and natural gas prices. The U.S. upstream business cannot be separated from the global upstream business because of one important commonality which is commodity price. The non-competitive nature of the oil market presents a situation where individual entities do not dictate prices based on associated finding and production costs. Profitability involves achieving positive margins which means increasing the difference between cost and price. Companies cannot control price; however the only control variable is cost. The search for lower cost operations has led to the growth of ventures into international locations by U.S. companies to be discussed in a later section.

Price impacts several industry parameters such as:

**Revenues.** Revenues are generated as a result of the sale of produced oil and natural gas. The level of revenue has a direct relationship with the amount of production and price of the produced commodity. Using IPAA data, we observe that although production in the U.S. has been declining since 1970, the same is not true for generated oil wellhead revenues. The yearly total revenues for the U.S. exhibit a fluctuating behavior; nevertheless, these fluctuations can be matched with fluctuations in the oil and natural gas commodity prices. **Fig 19 & 20** illustrates the two points made above.

**Exploration and Drilling Activities.** The industry's rotary rig count represents the average number of drilling rigs that are actively exploring for oil and natural gas resources. The parameter acts as a yardstick to help determine how the exploration aspect of the business is fairing. The number of active rotary rigs available has been found to have a relationship with crude price. **Fig 21** shows the graph of number of rotary rigs and crude price over time. A trend is observed indicating that periods of high crude prices correlate with periods of high activity in the industry indicated by the increased number of active rotary rigs. It is interesting to observe that the peak in the number of active

rotary rigs fits with the peak crude price in nominal terms which occurred in 1981. This also translated in the number of exploratory drilled that year which was the highest at 17,430. The exploration and drilling activities trend is accurate and still mimics occurrences even to the present, however, we notice that ever since the collapse of prices in 1986, the number of active rotary rigs has fallen below 1000 active rotary rigs on average during the year. It hasn't regained momentum, leading to another industrial trend indicating that the level or zeal for exploration in the industry has declined as a whole. As mentioned in an earlier section, natural gas is now playing a significant role over oil in exploratory and drilling activities.

**Employment.** Employment in the upstream oil and natural gas extraction segment is significantly impacted by crude prices. This can be seen in **Fig 22** showing employment in the oil and natural gas extraction segment with crude price. A relationship is observed where; price has an effect on employment level. During boom periods, the industry has more exploratory and drilling activities yielding the need for more labor and employees. Moreover, during bust periods, activities are declined and cost cutting techniques come into play via job reductions to reduce overhead costs. The industry experienced its peak employment level in 1981, when oil prices were at its peak in nominal terms. Even with the market recovery post 1986, the employment level in the exploration and production companies has declined drastically. The fluctuations in the employment level still follow the fluctuations in prices, although recently, companies are trying to manage their staff adequately irrespective of crude prices.

**Research and Development.** Research and Development (R&D) costs like other variable costs in the upstream petroleum industry have been plummeting since the oil crash in 1986. Companies have cut spending in this area because of the levels of investment required compared to the economic gains. R&D is an essential component beneficial for industry growth and progress. The R&D process involves finding new ways to reduce the cost to find and extract oil and natural gas by improving efficiency. Without new technologies, like 3-D seismic, horizontal drilling, multi-lateral drilling, extended reach drilling, and deep water drilling, etc., it is hard to imagine what state the industry would be in. The service companies are taking up this role in R&D. As the E&P companies

R&D spending goes down, that of the service companies is increasing. The service companies can incur the high R&D costs because they can spread it around their many E&P customers when the new technologies are adopted. The adoption of new technologies by the E&P companies have been slow due to the fear of failure, focus on short term production goals and initial high cost of the new technology<sup>13</sup>.

***Proved Reserve Bookings.*** The U.S. upstream petroleum companies are evaluated financially primarily on the amount of proved reserves in their books. The Securities Exchange Commission (SEC) defines proved reserves as “the estimated quantities of crude oil, natural gas, and natural gas liquids which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from know reservoirs under existing economic and operating conditions, i.e., prices and costs as of the date of the estimate<sup>14</sup>.” This definition is significant because the reserves have to constantly be revised to account for changes in commerciality having direct impact on commodity prices.

## **6. INDUSTRY CONSOLIDATIONS – MERGERS AND ACQUISITIONS**

In the early 1980’s, upper management of E&P companies adopted directives focusing on being the low cost producer. The attempt to achieve the best value for stockholders and stakeholders has spurred a surge of consolidations via mergers and acquisitions that we observe in the oil and natural gas industry. Defining a merger or acquisition, involves a purchase or exchange of assets to create an enterprise that generates more shareholder value than the predecessor independently. There a number of reasons for the consolidation trend in the industry such as economies of scale, cost cutting, portfolio diversification, reserve replacement, and operational efficiencies<sup>13</sup>.

In a capital intensive industry such as the oil and natural gas industry, consolidation is advantageous in gaining economies of scale. Companies that come together utilize synergies by discarding system redundancies. This in turn, leads to lower overhead costs. Accounting principles teach that the lowest cost producer will make the highest profit and therefore will be the most successful<sup>15</sup>.

Profit maximization is not the only measure of stockholder value creation. Mergers and acquisitions (M&A's) are the fastest means by which an acquirer can significantly reposition its place in the competitive market. The U.S. upstream exploration and production companies are facing challenges with regards to production in mature U.S. basins which often lead to more difficult conditions, high costs, and technological expertise. M&A's are a way of acquiring the needed technical expertise. The traditional U.S. petroleum companies are dealing with the oil production depletion situation in the U.S. by diversifying their portfolio and buying properties outside the U.S. The companies don't want to put all their eggs in one basket and solely place their bets on U.S. activities for sustenance in light of the globalization of the industry. Going international provides the single largest opportunity to access large reserves at correspondingly low finding costs<sup>16</sup>.

As discussed in an earlier section, overall exploratory and drilling activities in the U.S. has been declining since the mid 1980's to the present compared to earlier times. Due to this fact, finding new reserves are limited. Reserve replacement is a crucial aspect of every company's competitive advantage. Challenges come into play for the U.S. petroleum companies in trying to replace the reserves they have produced. Because activities to find new reserves through the drill bit are low, these companies are achieving this reserve replacement through mergers and acquisition. In many instances, the choice of reserve replacement either through the drill bit or through M&A also comes down to cost. The result is that reserve replacement through M&A's tends to be easier and often cost less.

## **7. *OGJ* ANNUAL SPECIAL REPORT**

The *Oil and Gas Journal (OGJ)* special annual report ranks the largest publicly traded oil and natural gas producing companies in the U.S. The companies on the list include majors, independents, limited partnerships, and royalty companies. The list has transitioned over the years since its inception in 1983. The rankings were generated based on data from the previous year. The companies on this list represent a significant portion of the U.S. oil and natural gas industry. The list started as *OGJ* 400 with 400 companies,

and then changed to *OGJ 300* in 1991, and finally *OGJ 200* in 1996. The list change was eminent due to the shrinkage of the number of publicly traded companies available. Initially, the list was restricted based on a specified asset cutoff value. Over the years, the list had to be revamped and the cutoff adjusted because many companies could not meet the cutoff requirement. The reasons for the changes in the list correlate very closely with the activities of the industry. During the late 80's, periodic slumps in the price of crude oil and natural gas buffeted oil company profits. This as well as additional new environmental regulations drove up the costs of operations and restricted access to potentially productive areas. This forced an atmosphere where companies were forced to seek mergers, consolidate operations and sell assets in an attempt to sustain profitability. In some cases, companies liquidated, their assets sold to other members of the group or became privately held companies. This event translated to slashing of the number of companies available for the *OGJ* rankings. The list changed over the years due to industrial consolidations, bankruptcies, privatizations, liquidations and sale of U.S. oil and natural gas properties.

The *OGJ* list is different from year to year, with variation in the companies on the list, as well as the size of the list, therefore, any attempt to make an analysis on the group list as a single entity will be biased. However, to give a general summary and observe any trends in the overall list over the years, we will look at some of the parameters on the list. **Fig 23** is a graph of the group total assets over time. From the graph, we observe that from the period 1982 to 1991, when the list was *OGJ400*, that on average the assets for the total group was on a decline. The assets for the fewer companies in *OGJ300* list thereafter, saw a pick up in assets. Finally, the *OGJ200* period saw greater increase in the asset value for the total group greater than the values of the *OGJ400* and *OGJ300* lists. This is very interesting because the *OGJ200* list is a shrunken list including fewer numbers of companies; indicating that these companies have become giants and attained their asset level through the consolidation efforts of the industry designed to sustain profitability of individual companies. Company revenues are generated from sale of produced oil and natural gas; therefore, revenue is dependent on the commodity sale prices. **Fig 24** is a graph of the *OGJ* group revenues with crude price over time. When

prices are high, the overall group benefits yielding higher revenues, however, if the converse is true, the group is affected and revenues are lowered. Earnings from exploration and production activities are inline with operational activities trends. The overall *OGJ* group spending on capital and exploratory activities is reflective of the associated earnings. More generated revenues resulted in increased spending and vice versa. This is illustrated in **Fig 25**.

U.S. oil production trend for the companies on the *OGJ* list follow inline with the crude production trend for the U.S. upstream petroleum industry as a whole. The oil production for the group on average has been on a decline. The graph of U.S. oil production for the total *OGJ* group is shown in **Fig 26**. Natural gas production for the list showed an increasing trend over the years similar to the natural gas production of the U.S. natural gas industry. However, the list's natural gas production began to decline in 1997 and deviated from the increasing trend of the overall industry. This indicates that in recent times, a substantial amount of natural gas production is not coming from the companies on this list. The graph for U.S. natural gas production for the total *OGJ* group is shown in **Fig 27**.

The oil and natural gas industry was an industry primarily dominated by operations in the U.S. The industry has evolved over time into an increasingly global and international industry. The U.S. companies are taking advantage of the opportunities available outside the U.S. The internalization trend is collaborated by **Fig 28** and **29** showing the percentages of U.S. oil and natural gas production and reserves possessed by the companies on the *OGJ* list. From these graphs, we observe that these companies have diversified their portfolios substantially to incorporate international assets. In terms of oil production, the companies have gone from having 66% of total production in the U.S. in 1982 to about 38% in 2003. For natural gas production, 82% and 59% represented the percentage natural gas production in the U.S. in 1982 and 2003 respectively. These U.S. production trends are also consistent with trends for oil and natural gas reserves.

The surging importance of natural gas operations is collaborated by the *OGJ* group list. **Fig 30** shows a graph of U.S. equivalent natural gas to oil production and reserve ratios.

This graph indicates that the companies on the list are producing and finding more natural gas than oil than before. The production ratio surpassed the value of one in 1995 and has continued to increase. As a consequence, the companies on the list are deriving higher revenues as a result of natural gas production than oil. This is shown in **Fig 31**.

Overall, the results of the companies ranked by the *OGJ* annual special report list follow very closely with the results of the U.S. upstream petroleum industry as a whole. Therefore, using this list as an insight into the U.S. industry would be adequate because these companies account for a significant portion of the U.S. petroleum industry in all aspects.<sup>3</sup>

## **8. OVERVIEW OF THE TRADITIONAL U.S. E&P COMPANY**

The oil and natural gas industry is a growing and profitable industry. We observe this from growth in revenues and profits which are congruent with adequate commodity pricing. Overall, all the U.S. oil and natural gas companies with E&P operations have been growing not only in size but also in reserve and production capacity. Some of this growth can be attributed to mergers and acquisitions which provide opportunities to enter international operations and diversify their portfolio.

Most of the traditional U.S. E&P companies follow a company cycle. The cycle is initiated by acquisition of marginal fields from the super majors, followed by the company's establishment of its domestic presence through intense exploratory and drilling activities. The next aspect of the cycle is the strengthening of the company's domestic presence often done through mergers or acquisitions. When the company achieves strength due to size, they divest from uneconomical fields. Finally, the cycle continues with portfolio diversification through international partnerships and arrangements. This cycle trend is observed in the four companies analyzed in the report with the exception of Chesapeake. Three of the four companies opted for international operations to generate more value to their stockholders.

The main objective of every company is to provide the best value for the stockholders and stakeholders. Each company's definition of value varies internally but there are some basic principles and methodologies that are central and basic to most of the companies.

## **9. COMPANY ANALYSIS**

### **APACHE PETROLEUM CORPORATION**<sup>3,16</sup>

Apache Petroleum Corporation has come a long way since its inception on December 6, 1954 to being one of the top independent U.S. E&P companies. The company has dabbled in other business activities such as orange growing, auto parts sale, ranching, telephone exchanges, real estate, etc. However, over the years, the company has transitioned to becoming a solely oil and natural gas focused entity. Apache's core business is in oil and natural gas exploration and production with core operations in the U.S., Canada, Egypt, U.K. North Sea, Australia, and China. Apache growth in the upstream industry over the years since its inception has been primarily due to exploratory drilling and development activities as well as strategic acquisitions.

Apache Corporation designates the period of the 80's as a period where the company returned to its roots. To strengthen their foothold in the upstream business, Apache Corporation made strategic decision by committing to several acquisitions and joint ventures in the first half of the 1980's. This was achieved by the formation of the 1<sup>st</sup> master limited partnership (MLP) called Apache Petroleum Limited. The MLP acted as an acquisition vehicle, and Apache took advantage of this MLP by acquiring properties from Dow Chemical Company, Occidental, and Shell. The partnership provided significant earnings for the company and planted the seeds for consolidation of interests and growth through acquisition that would come to define Apache after the price collapse in 1986.

Following the price collapse in 1986, the company's focus was on restructuring and finding alternative growth sources and means. The end of the 1980's started off with a company transformation involving the sale of all the non oil and natural gas properties and subsidiaries, and exiting the business of managing oil and natural gas related

investments. At the end of 1988, Apache emerged as a pure exploration and production company. With the industry rebounding at the end of the 80's, Apache saw opportunities abroad and began to target exploratory efforts in international areas.

The storm of acquisitions that began in the early 1980's resurfaced in the 1990's. The period of the 1990's was a strategic one for Apache. They wanted to be competitive so they went where the action was. The major acquisitions involved expanding business operations in the U.S., strengthening presence in GOM, expanding natural gas business, and going international (Canada, Australia, Egypt, and China).

The start of year of 2000 to the present reflects a period of international growth in Apache's life. The company took the plunge into deep water operations and also acquired the forties field in the North Sea.

Over the past 25 years, Apache has shed itself of its non oil and natural gas assets, went international before it became the thing to do and achieved a critical mass. The company demonstrated a strong and relentless work ethic and an ability to adapt, innovate, survive and thrive through the unique challenges posed by repeated industry cycles.

Appendix A provides graphs and a table of Apache's operating results and activities. From the plots in Appendix A, we observe that Apache has experienced tremendous growth over the years. They have gone from being a primarily U.S. producing E&P company since the 1980's to becoming dominant on the international scene. Apache diversified its portfolio to include international assets in 1991 and over the years it has increased its share of production and reserves internationally. At the current level, about 60% of Apache reserves are located internationally. Apache's success of going international has been a result of many strategic mergers and acquisitions. The M&A activities also helped contribute to Apache's asset growth. Since 1983, Apache has approximately increased its assets by 2100%.

Although the percentage of Apache's operations in the U.S. has been declining, its U.S. production and reserves curve are rising on average. An interesting observation is the Apache's U.S. Reserve/Production ratio for oil. This ratio has been increasing over the

years from a value of 7 in 1982 to a peak value of 15 in 2002. This indicates Apache's production activities are becoming increasingly challenging with increased costs. The plots of U.S. equivalent natural gas to oil production ratio indicates that in the course of time since 1982, this ratio has been declining. Although the ratio is still greater than one, it shows that Apache is more successful at replacing and finding oil reserves than natural gas reserves. However, yearly revenues generated from natural gas activities have been higher than from oil activities over the past 20 years.

### **ANADARKO PETROLEUM CORPORATION**<sup>3,17</sup>

Anadarko Petroleum Corporation was established on June 8, 1959, a subsidiary of Panhandle Eastern Company who was finding and producing large amounts of natural gas in what had become the Anadarko Basin, in the Texas and Oklahoma panhandles and southwest Kansas. Now, Anadarko has become one of the largest and most successful independent exploration and production companies in the world. Anadarko strategy has always looked towards long-term value creation involving the addition of economic reserves at low finding costs. Their strategy focus has changed through the years responding to new exploration opportunities and technological advances. Anadarko has activities in more than 12 countries with principal operation in the U.S., Canada, and Algeria.

The period of the 1980's was big for Anadarko; it began trading on the New York Stock Exchange (NYSE) despite the upsets in the market. During this period, Anadarko did not focus on layoffs following in suite with its competitors. The company focused on a long term value creation strategy that involved growth achievement through the drill bit rather than relying on acquisitions. Anadarko took advantage of deep exploration opportunities in the GOM and opportunities in Canada as well as opportunities available internationally in Algeria by having a Production Sharing Contract (PSC) with SONATRACH, the Algerian National Oil Company. During this period, Anadarko was aware of the increasing importance of natural gas; therefore, they developed a strategy to expand and control marketing capabilities by acquiring several natural gas gathering and processing systems.

Anadarko's strategy for the 1990's was strengthening the company through international diversification of assets. 1991 started with the spud of the 1<sup>st</sup> Algerian well. The company delved into exploration agreements and contracts with several countries and locations including Jordan, Peru, Indonesia, Eritrea, Tunisia, and the North Atlantic Margin. Also during this period, Anadarko made some big strides in terms of domestic growth through acquisition of properties in the Permian basin which tripled production from this area.

Unlike Apache, Anadarko's acquisition frenzy was delayed till recent times. Anadarko saw this period as an opportune time to gain access to prospects, technical expertise, and financial resources to bring faster growth and greater profitability than before. It started with the 2000 merger with Union Pacific Resources solidifying Anadarko's position as one of the largest independent E&P companies. This consolidation activity doubled Anadarko's proved reserves. Other Anadarko's M&A activities are provided in Appendix B.

From the plots in Appendix B, we observe Anadarko has grown significantly over the past 20 years. This is illustrated in graph B-1 showing its asset growth over time. For the most part, Anadarko's growth can be attributed to drill bit growth. Only till recent times, did Anadarko seek fast growth and divulged into large industrial mergers and acquisitions. Anadarko has been a player on the international oil scene since the 80's. Its position in terms of oil internationally has grown as a result, reducing the percentage of its reserves in the U.S. from a value of 80% in 1986 to about 10% in 2002. Anadarko's natural gas operations unlike that of oil, is located primarily in the U.S. Anadarko's internationalization process has also been due to strategic acquisitions and partnerships with the producing countries government.

Similar to Apache, Anadarko's revenues as a result of natural gas operations has proven to be higher than that of oil on a yearly basis. Anadarko's U.S. equivalent natural gas to oil production and reserve ratio also seems to have a declination trend on average. Although it had a spike in 2002, it returns to follow the trend in 2003.

Although the ratio is still greater than one, it shows that Anadarko is more successful at replacing and finding oil reserves than natural gas reserves.

### **CHESAPEAKE ENERGY CORPORATION**<sup>3,18</sup>

Chesapeake Energy Corporation is one of the 4 largest producers of natural gas in the U.S. and it also owns interest in approximately 20,000 producing oil and natural gas wells. The company's operational areas are focused in the prolific US natural gas producing regions of the Mid-Continent, Permian, South Texas Gulf Coast, and ARK-LA-TEX basins. Over the years, the company's strategy has involved an aggressive advanced drilling program combined with and an active property consolidation program. The company anticipates the growing demand for clean burning, domestically-produced natural gas; consequently, they are focusing on a balance of natural gas acquisition, exploitation, and exploration to provide strategic and substantial value-creating growth opportunities in the years ahead.

Chesapeake Corporation has grown tremendously since its incorporation in 1989 from a small enterprise focused on generating oil and natural gas prospects for sale to industry partners and as a non-operating participant in wells drilled by others.

From the onset, Chesapeake's strategy in creating value for its investors was building one of the largest onshore natural gas resources in the U.S. This is evident in Fig C-8 showing the percentage of Chesapeake's production in the U.S. Since its inception, 100% of Chesapeake's oil production has been in the U.S. In terms of natural gas, Chesapeake has tested the international areas in the past; nevertheless, a majority of its natural gas production has always been in the U.S. Chesapeake has grown and achieved success through a drilling program as well as an active property consolidation program focused on small to medium – sized corporate and property acquisitions.

The company's reserves and production on average have had an increasing tendency. When it comes to revenue generation, natural gas provides more revenue for Chesapeake when compared to oil. This can also be attributed to the fact that their

U.S. equivalent natural gas to oil production and reserve ratio has an increasing trend. Appendix C provides graphs highlighting Chesapeake's operations and activities.

### **DEVON ENERGY CORPORATION**<sup>3,19</sup>

Devon Energy Corporation was founded in 1971 and since then, it has grown to becoming the largest U.S.-based independent oil and natural gas producer and one of the largest independent processors of natural gas and natural gas liquids in North America.

Devon's growth is attributed to a few strategic high priced mergers and acquisitions. The M&A activities, helped in the company's asset and revenue growth over time. This also ensured continued increase in Devon's oil and natural gas production and reserves since the 80's. In recent times, since 2000, it is interesting to note that Devon's production and reserves with respect to oil have suddenly been on a decline. Additionally, as a result, the revenues derived from oil have also been on a recent decline trend. Natural gas revenues on the other hand have been increasing. The reserve/production ratio for this company is very cyclical and a unique trend can't be identified.

Devon production and reserves started off totally dedicated to the U.S. Starting in the mid 90's, they began diversifying their portfolio to go international. The company operates in selected international areas including Brazil, West Africa, the Middle East and China. In recent times, we observe a fluctuating behavior in international participation varying from year to year. Appendix D highlights Devon's operations and activities with a table and graphs.

## **10. SUMMARY**

The upstream petroleum industry is global in nature and has experienced periods of ups and downs throughout its life. Historically, the U.S. petroleum industry was dominant with a majority of production and consumption occurring within the country. This has changed tremendously; along with this change, we can observe several trends that have

occurred in the U.S. upstream petroleum industry. Looking back 25 years, one trend that is observed in the U.S. upstream industry is the overall decline of oil production. Although the Alaskan Prudhoe Bay production and more recently, deep offshore production have helped in curtailing the decline rate, they are not enough to reverse the overall downward oil production trend. Another trend observed with the U.S. upstream industry is associated with the natural gas industry. The deregulation and opening of the natural gas market in the late 80's, opened the door for the increased natural gas production rates we observe today. Additionally, the development of unconventional natural gas sources such as coal bed methane, tight gas, gas hydrates and gas shale have been a contributing factor to the increase in U.S. natural gas production.

Increased demand of natural gas as a result of environmentalism, as well the increase in its value when compared to other energy sources such as oil and coal has generated pulse for natural gas as the new energy of choice. As a result, we observe a trend where the upstream companies are focusing their operations more and more on natural gas than oil because the revenues generated from natural gas operations are higher.

For the U.S. upstream petroleum industry we observe a trend of declination since the early 1980's for parameters such as employment, capital and exploratory spending, and exploratory and drilling activities, collaborated by the evolution of the number of active rotary rigs in a year. These parameters are also influenced by crude prices. Higher crude price consequently yield increased employment, capital and exploratory spending, and exploratory and drilling activities.

There are no observable trends in crude and natural gas prices; however, they are the cause of the cyclical nature of the upstream petroleum business. Variations in the commodity prices result from demand/supply issues, geopolitical issues, market speculations and anticipations, etc.

One industry trend that led to the interest of this report involves the recent upstream consolidations efforts shrinking the number of oil and natural gas companies and

inorganically growing individual companies into bigger entities. Reasons behind this trend include the achievement of synergies and operation efficiencies, cost reduction, portfolio diversification, and value generation and creation for stockholders.

The main objective of every company is to provide the best value to its stockholders and stakeholders. Each company's definition of value varies internally but there are some basic principles and methodologies that are central and basic to most of the companies. The four companies (Apache, Anadarko, Chesapeake, and Devon) analyzed in this report are similar in the sense that their operational efforts are primarily concentrated on exploration and production activities. Over the period that the companies appeared in the *OGJ* we observe significant growth in assets. Most of these asset growths can be attributed to M&A's throughout the company's life. Other similarities and trends observed among the companies is the desire for internationalization. The companies are taking advantage of low cost resources available outside the U.S.

Looking at the four companies analyzed from the *OGJ* ranking list, we notice that each company has differing strategies which yields growth and profitability for each. Each company is fairing well, indicating that there is no winning strategy. The stock price for the companies has been following an increasing trend. They follow in line with the trend of the S&P 500 Index. **Fig 32** presents the stock prices history of the 4 companies with S&P 500 Index.

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APPENDIX I

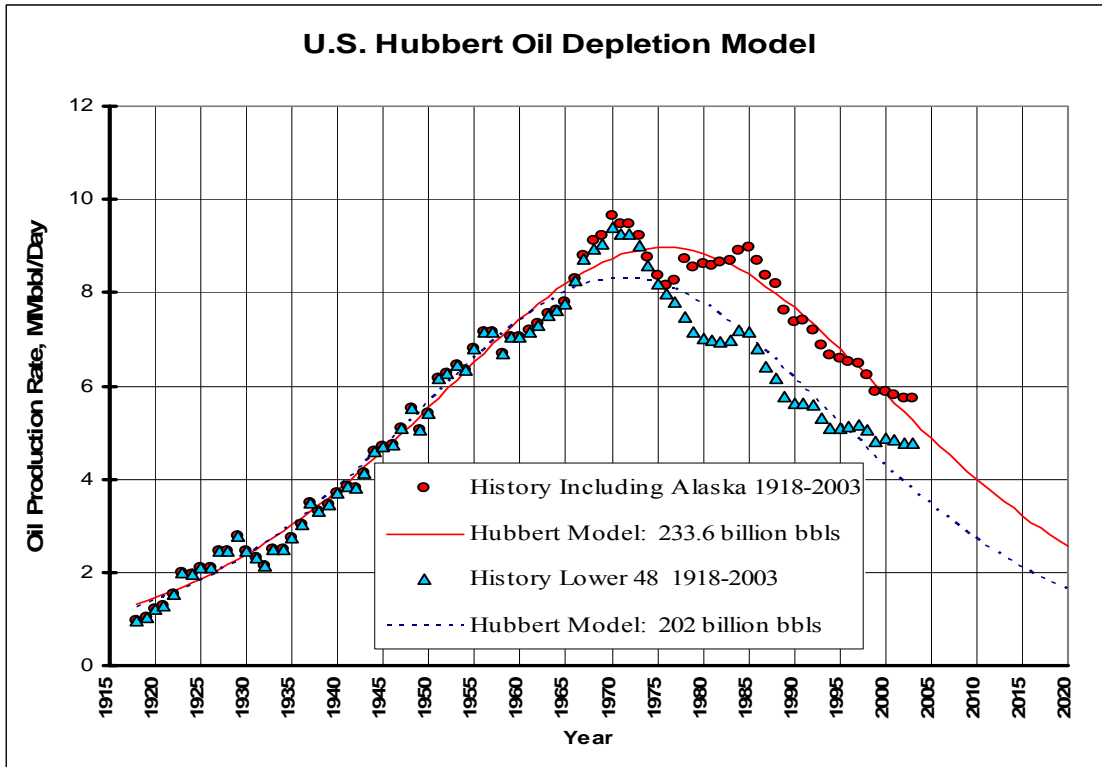


Fig 1 – Hubbert oil production decline curve for U.S. lower 48 with and without Alaska.

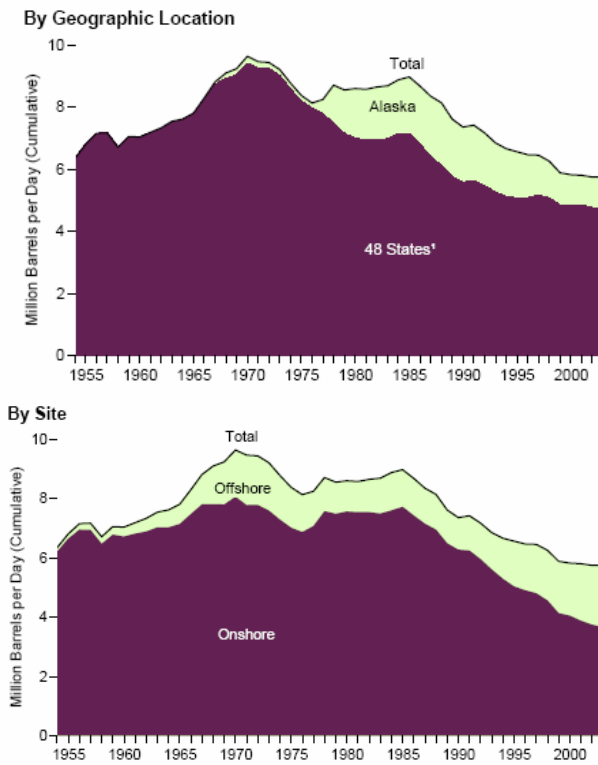


Fig 2 – Oil production sources by geographic location and by site.

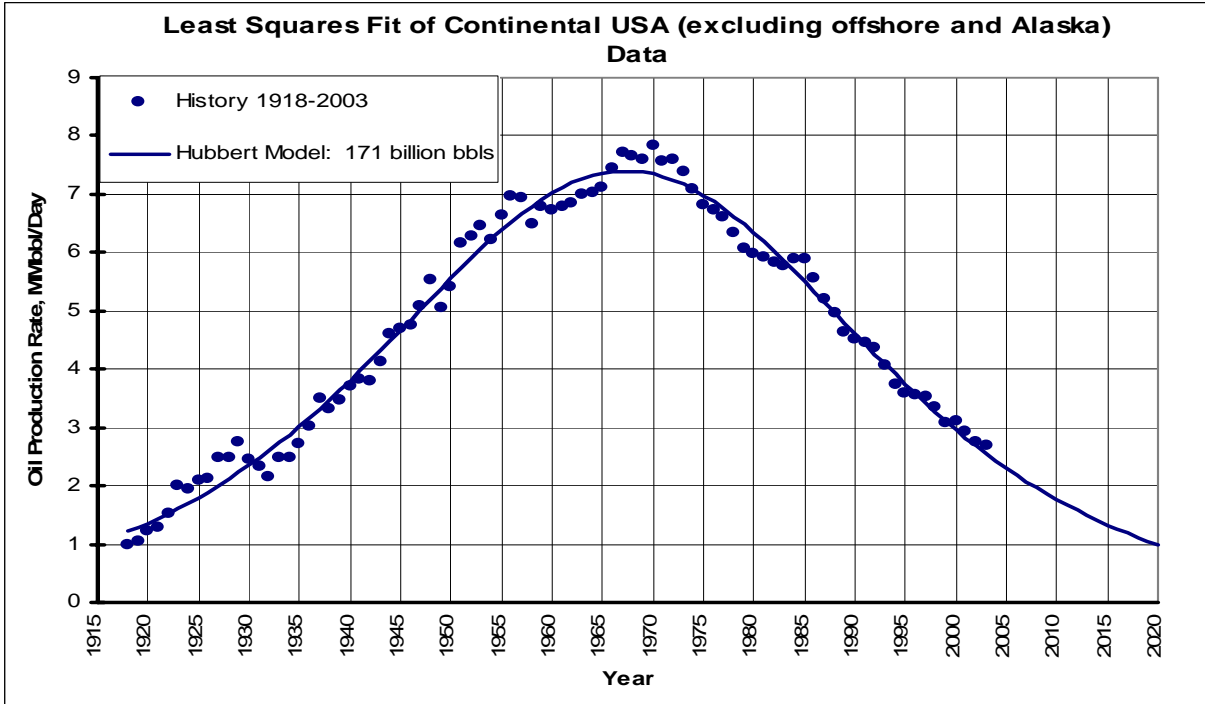


Fig 3 – Hubbert oil production decline curve for Continental U.S. excluding Alaska and Offshore.

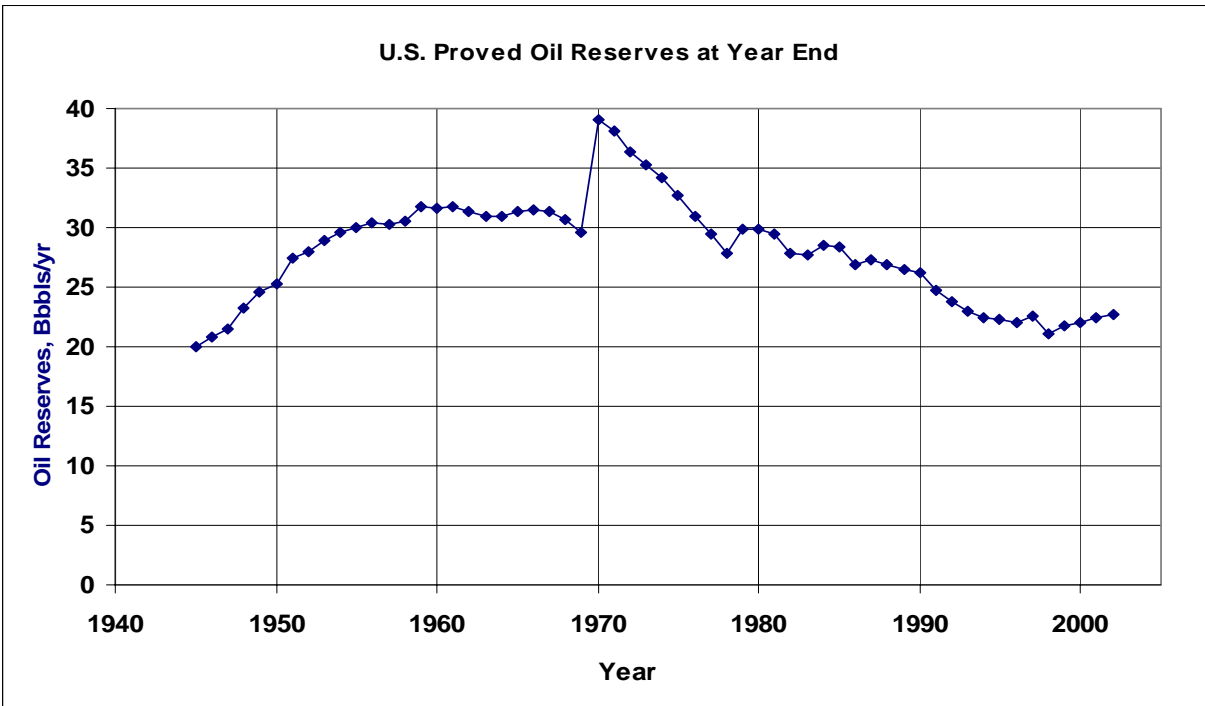


Fig 4 - U.S. proved oil reserves at year end.

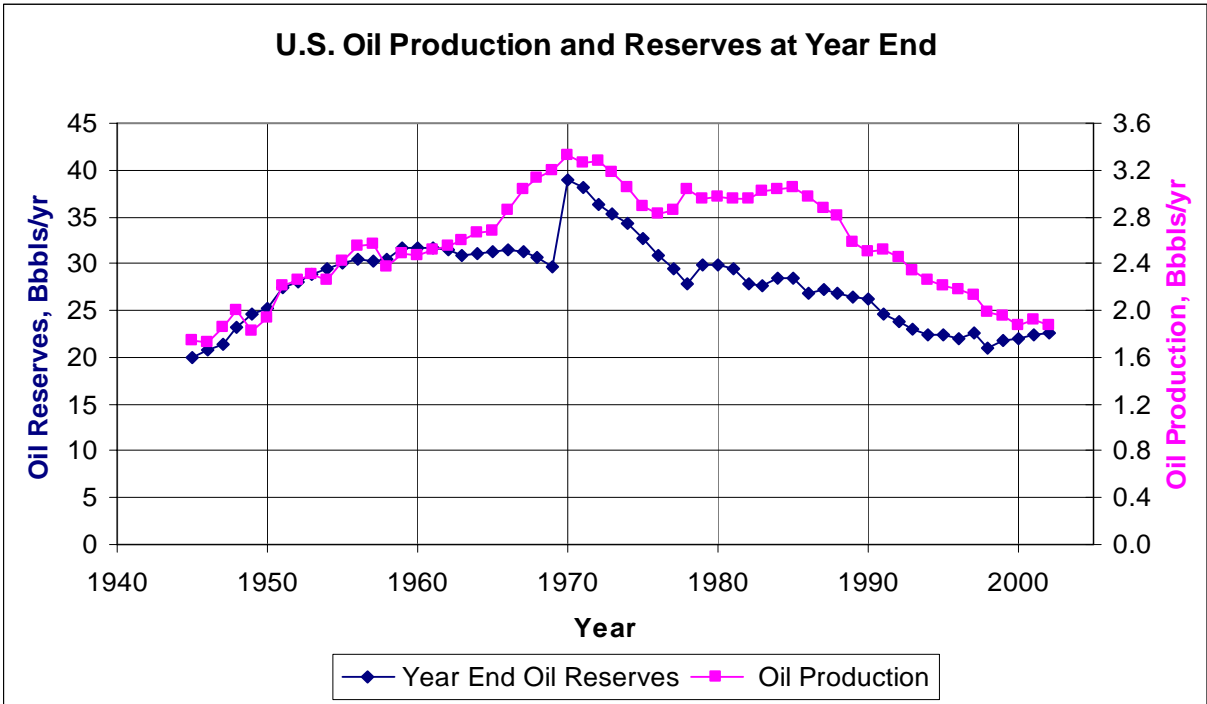


Fig 5 – U.S. oil production and reserves at year end.

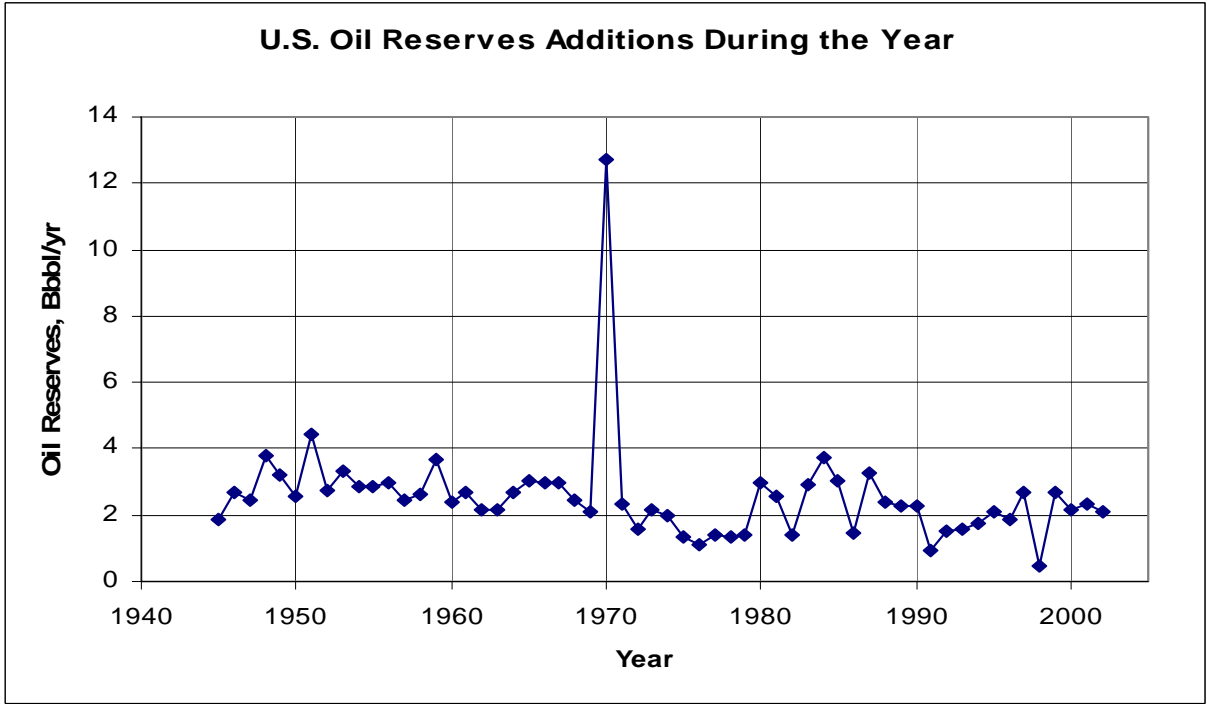


Fig 6- U.S. oil reserves additions during the year.

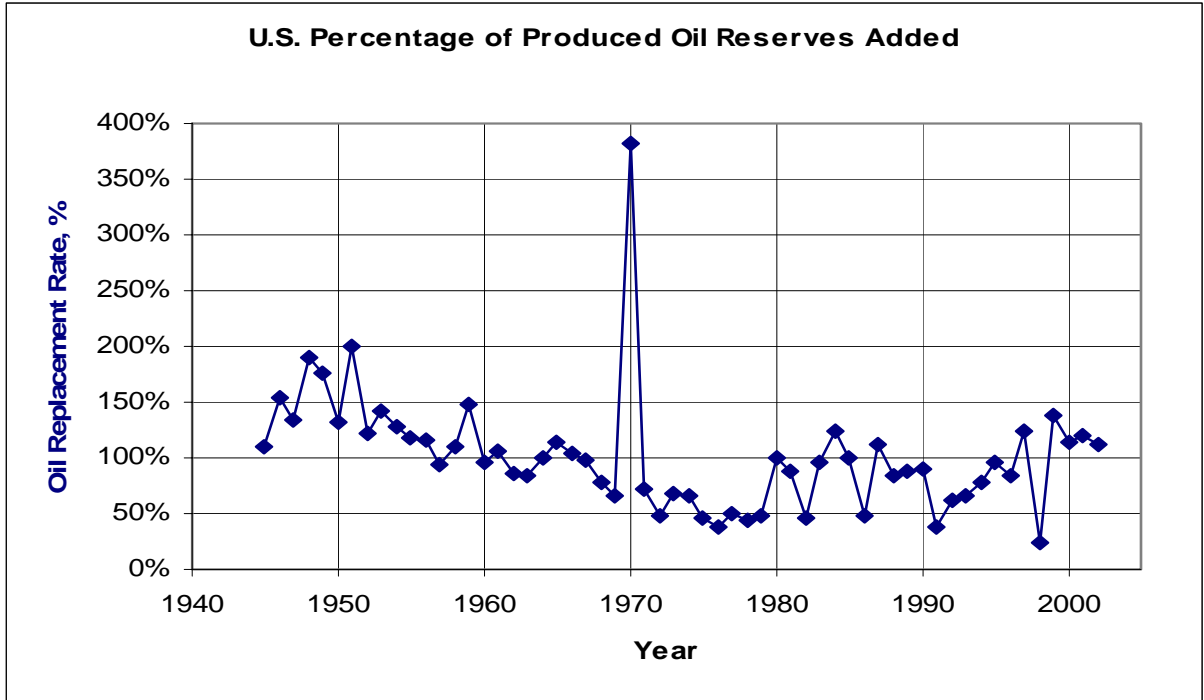


Fig 7 – U.S. percentage of produced oil reserves added.

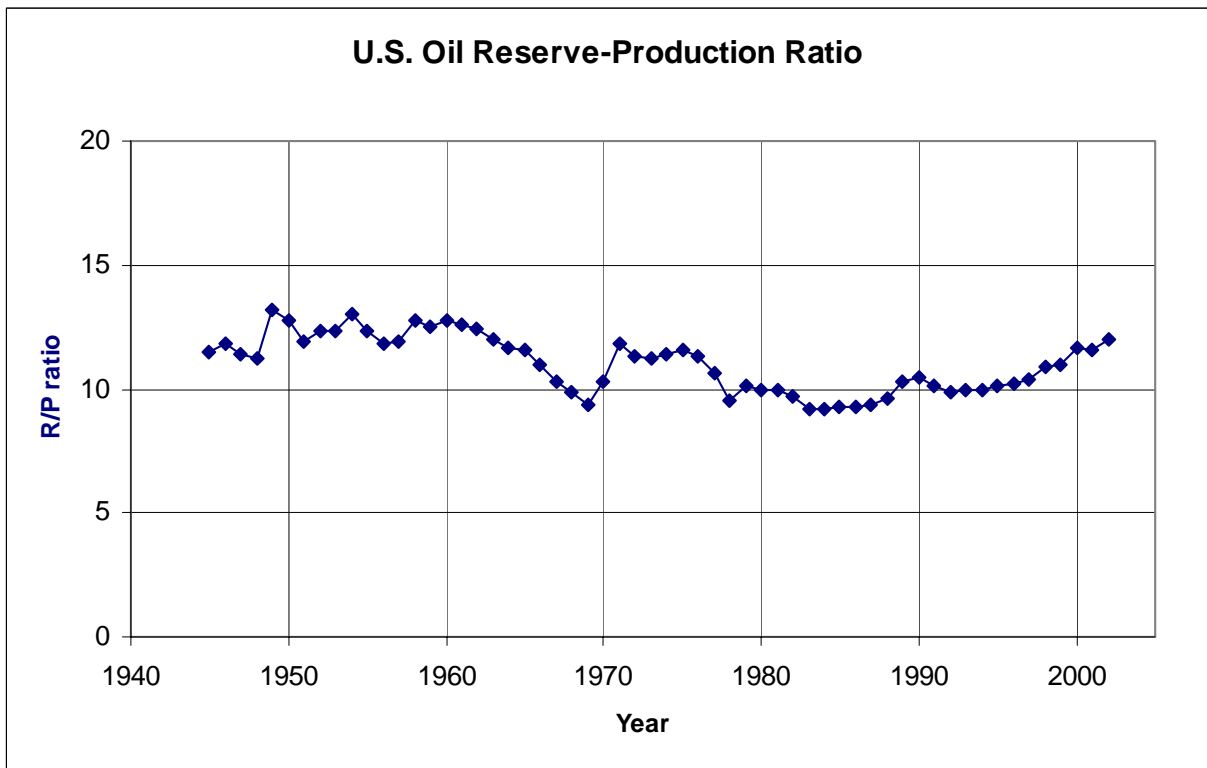


Fig 8- U.S. oil reserve-production ratio.

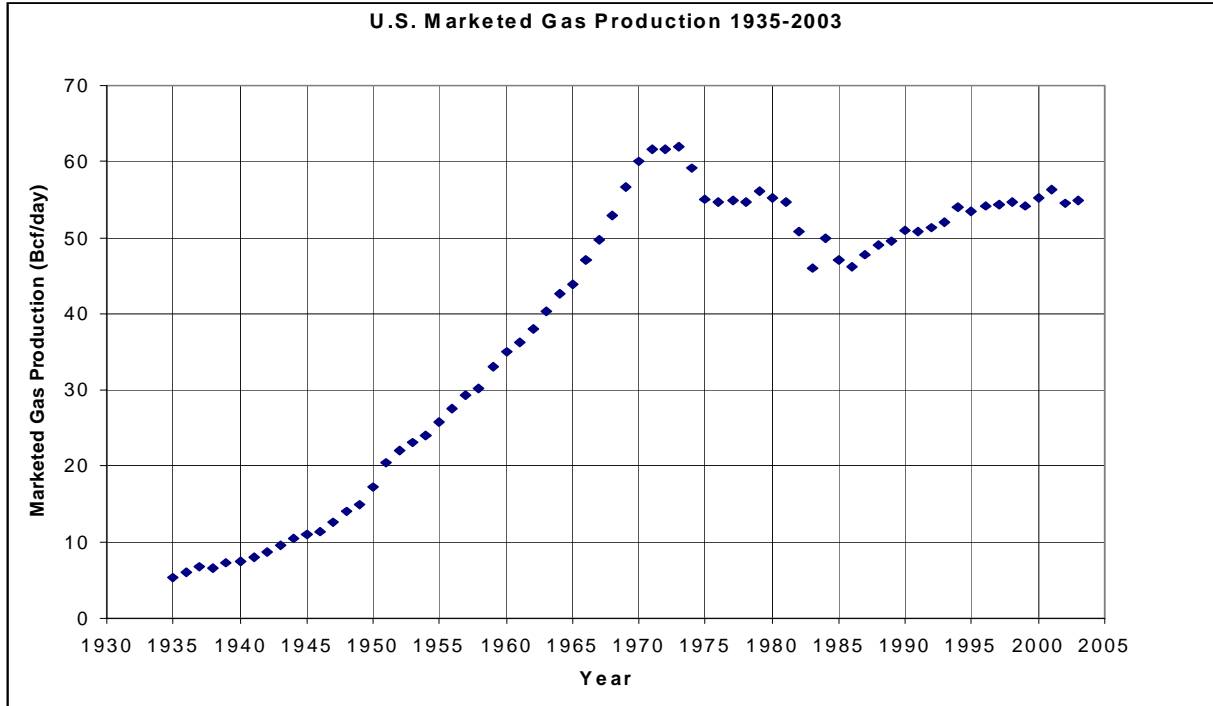


Fig 9 – U.S. marketed natural gas production over time.

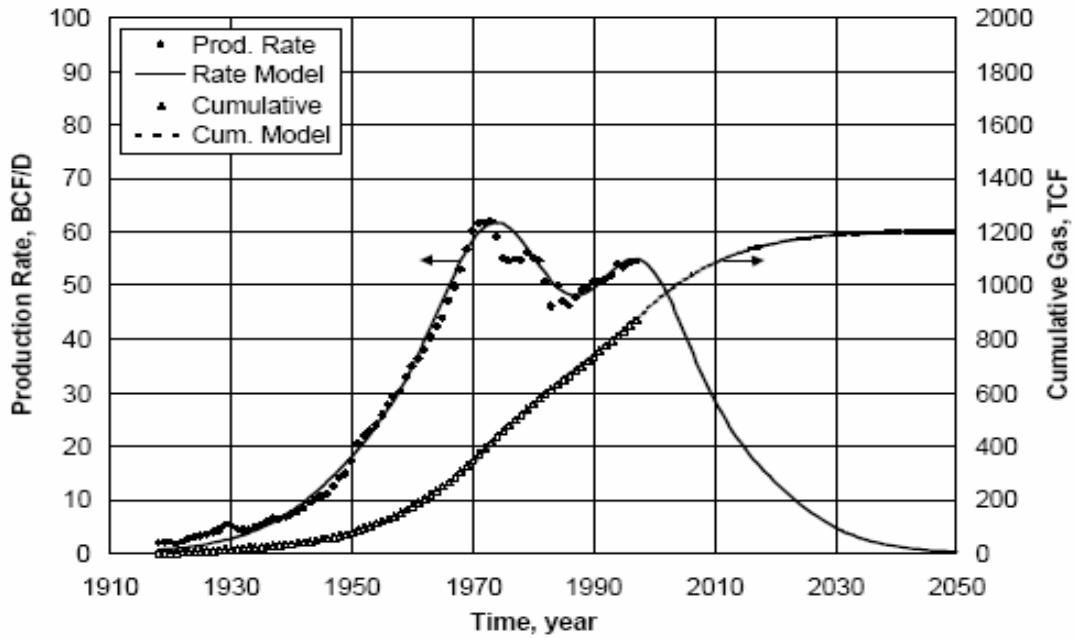
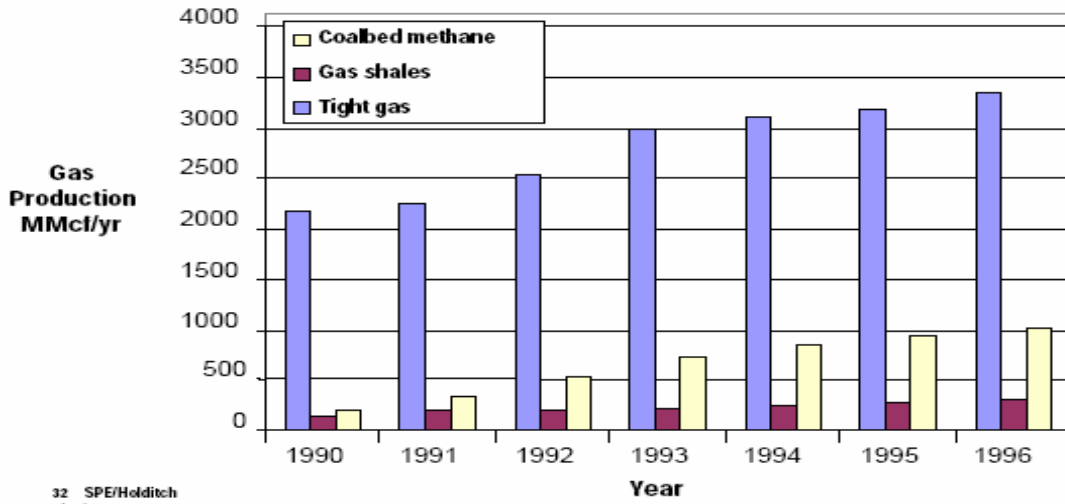


Fig 10 – U.S. natural gas production multicycle Hubbert Model<sup>8</sup>.

# Unconventional Gas Production



32 SPE/Holditch  
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Fig 11 – Growth trends in U.S. unconventional gas production.

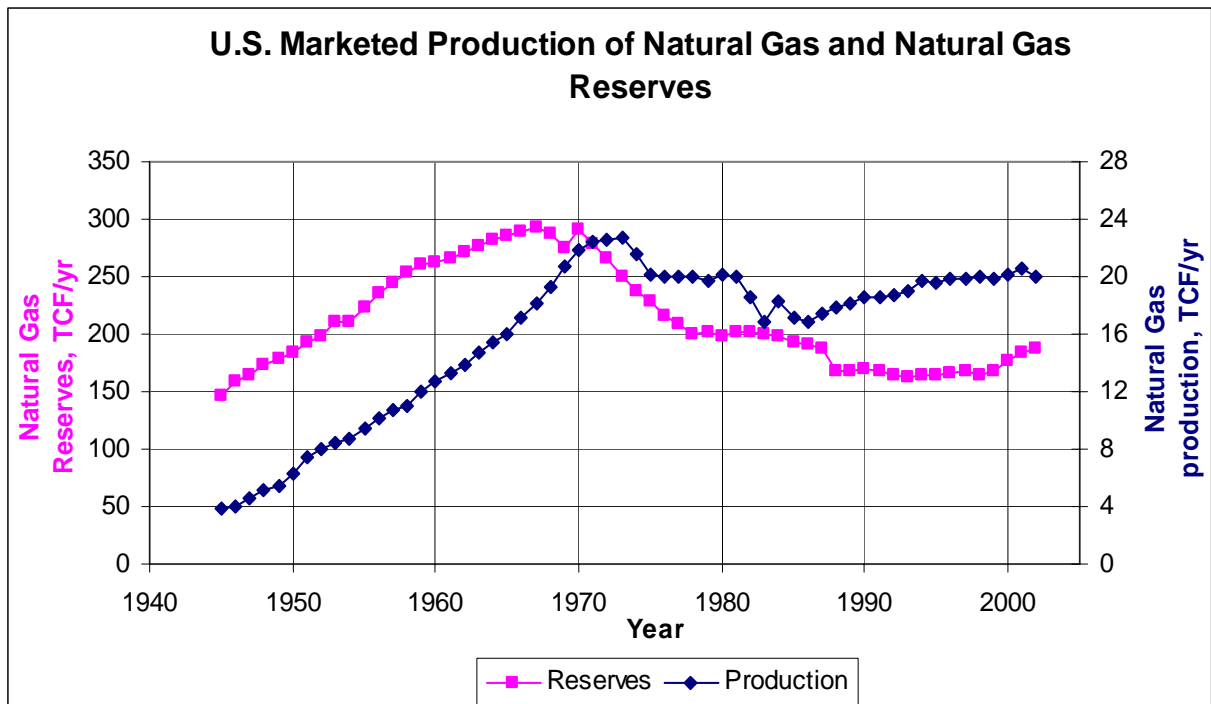


Fig 12 – U.S. marketed production of natural gas and natural gas reserves.

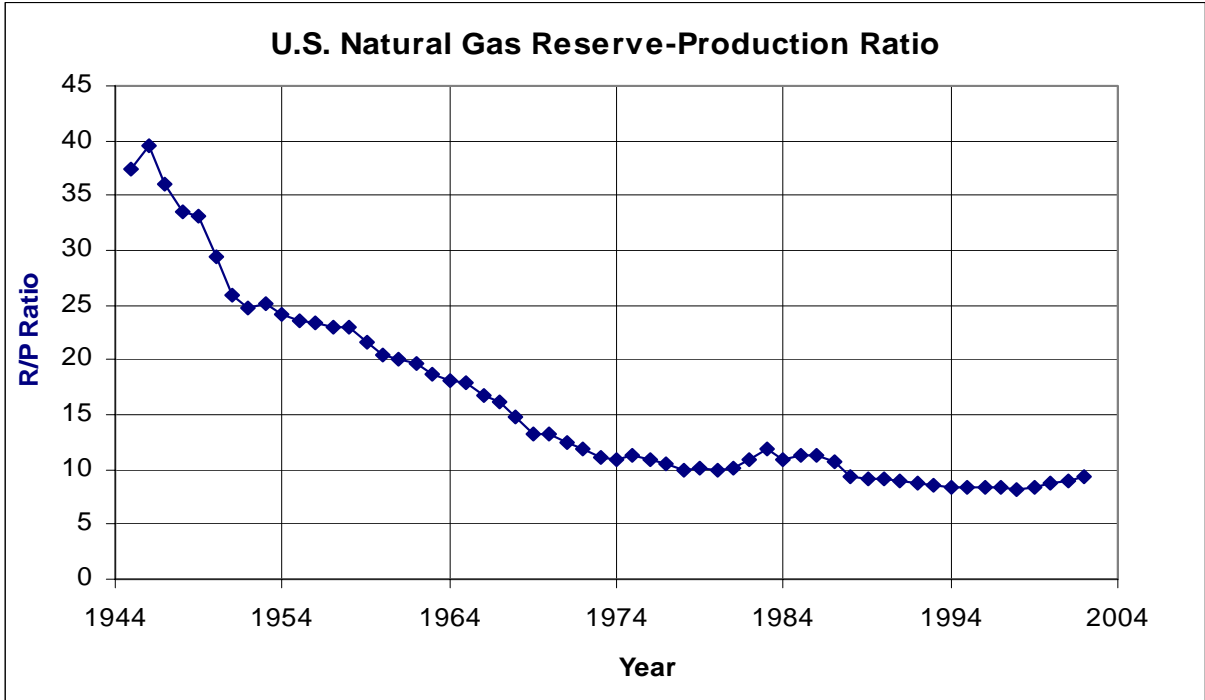


Fig 13 – U.S. natural gas reserve-production ratio.

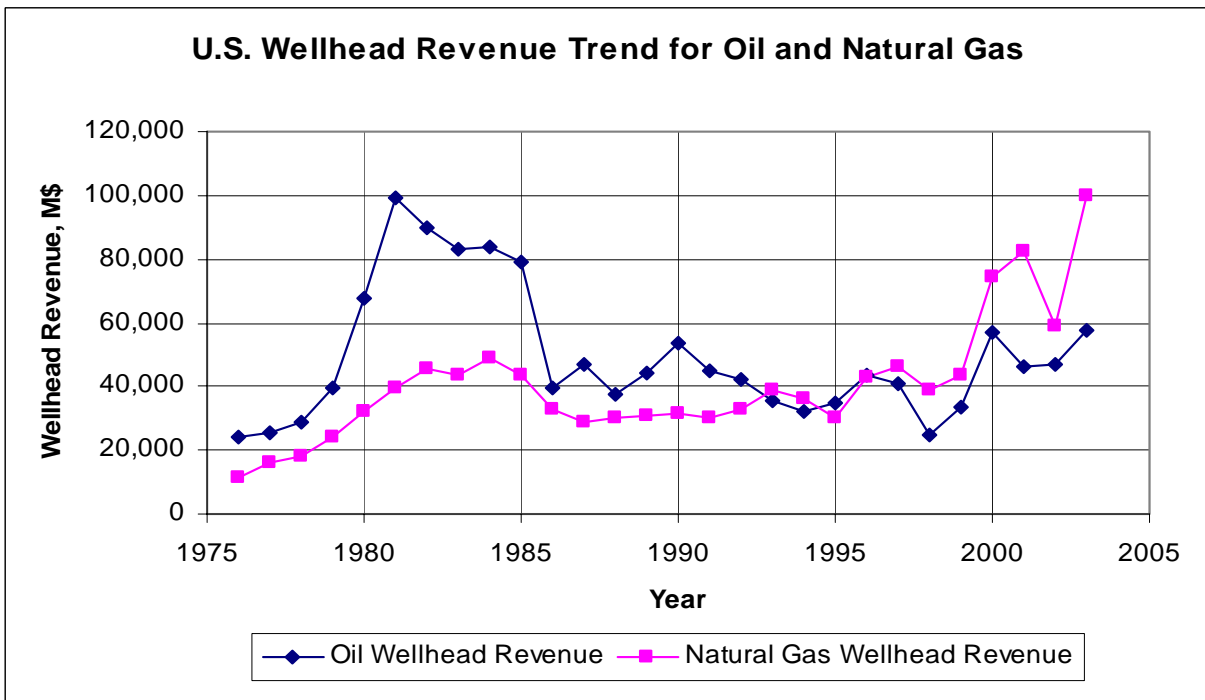


Fig 14 – U.S. wellhead Revenue trend for oil and natural gas.

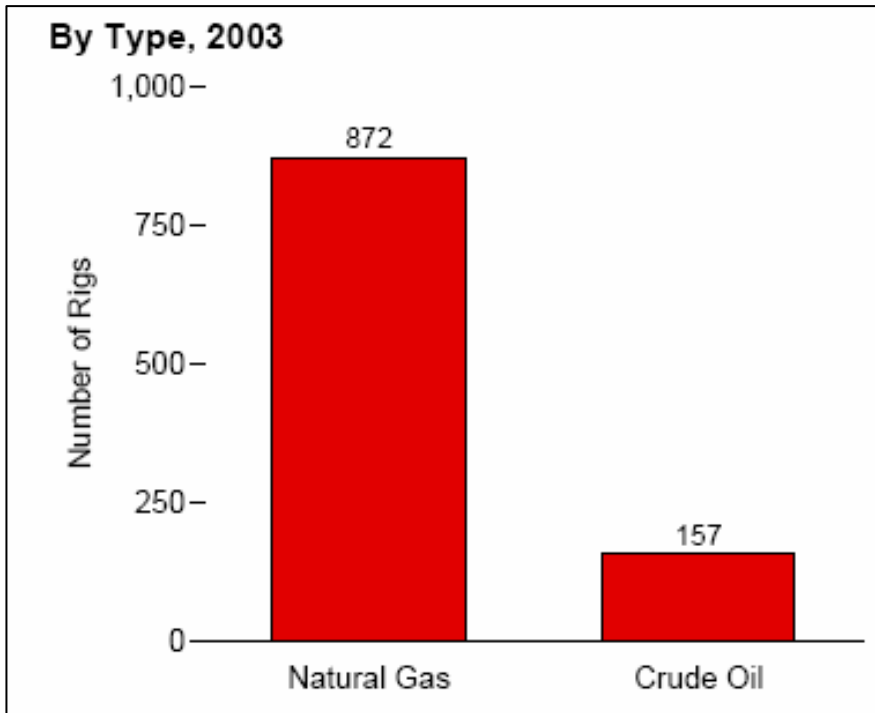


Fig 15 – Number of drilling rigs in 2003 associated to natural gas and oil operations.

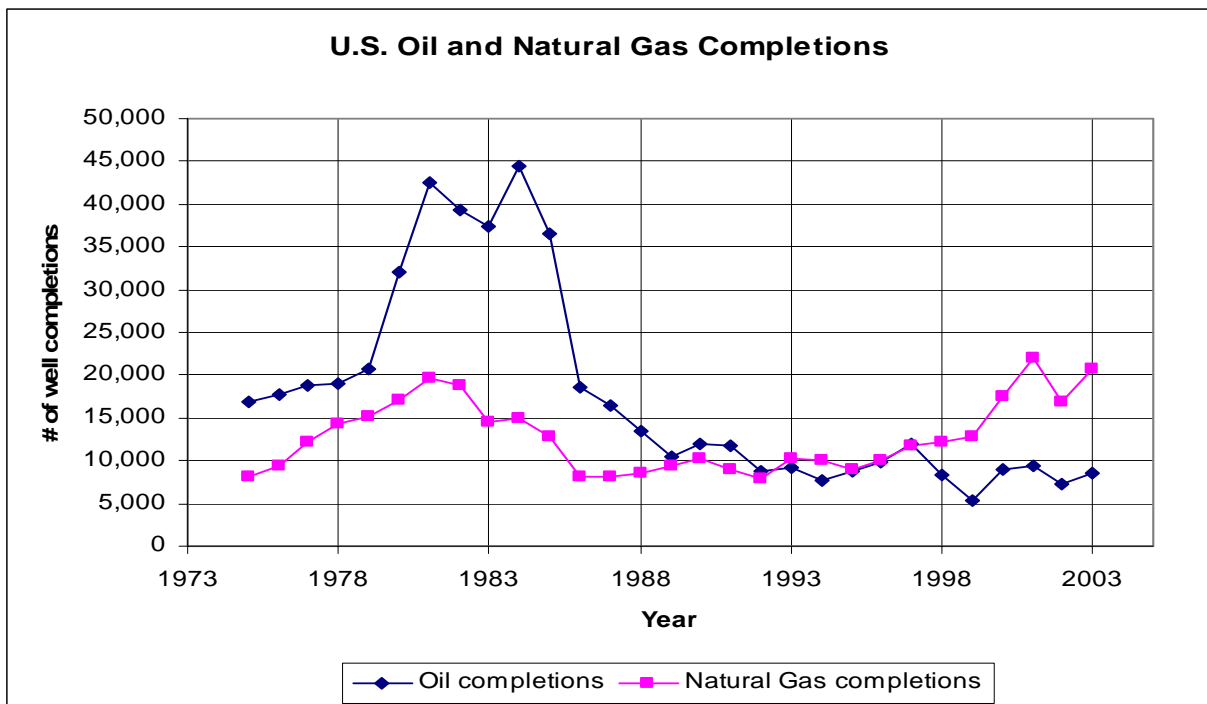


Fig 16 – U.S. completions for oil and gas wells.

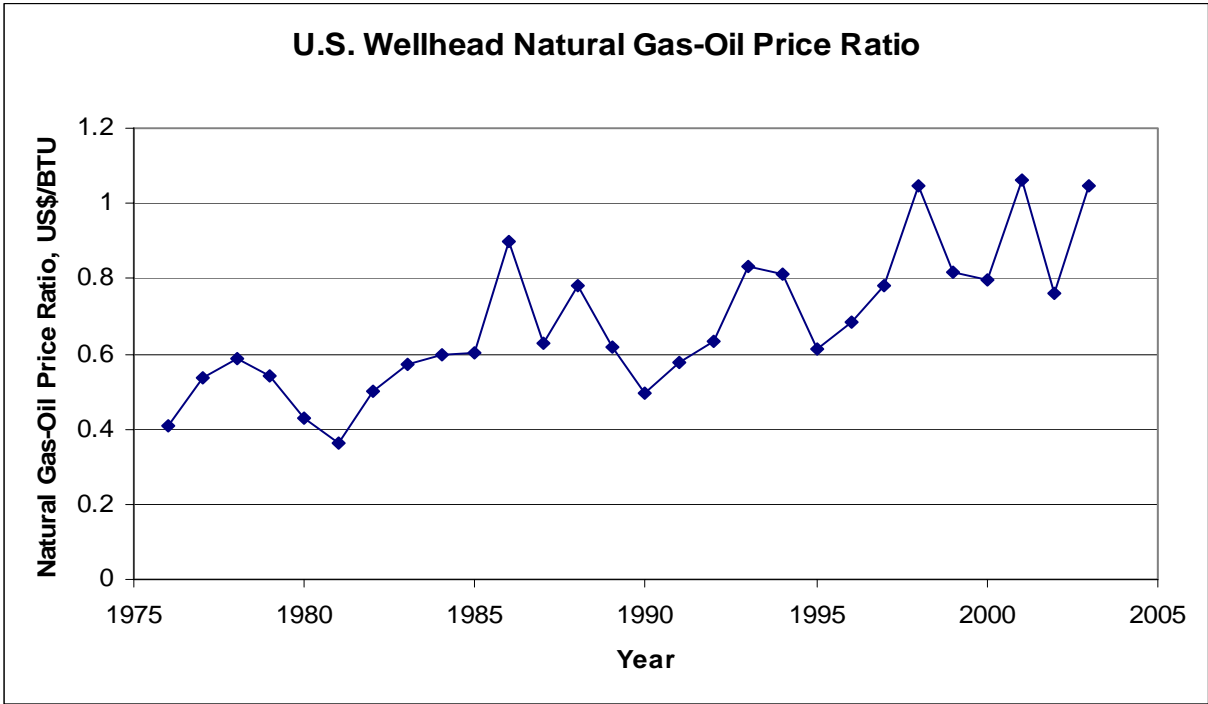


Fig 17 – U.S. natural gas to oil price ratios.

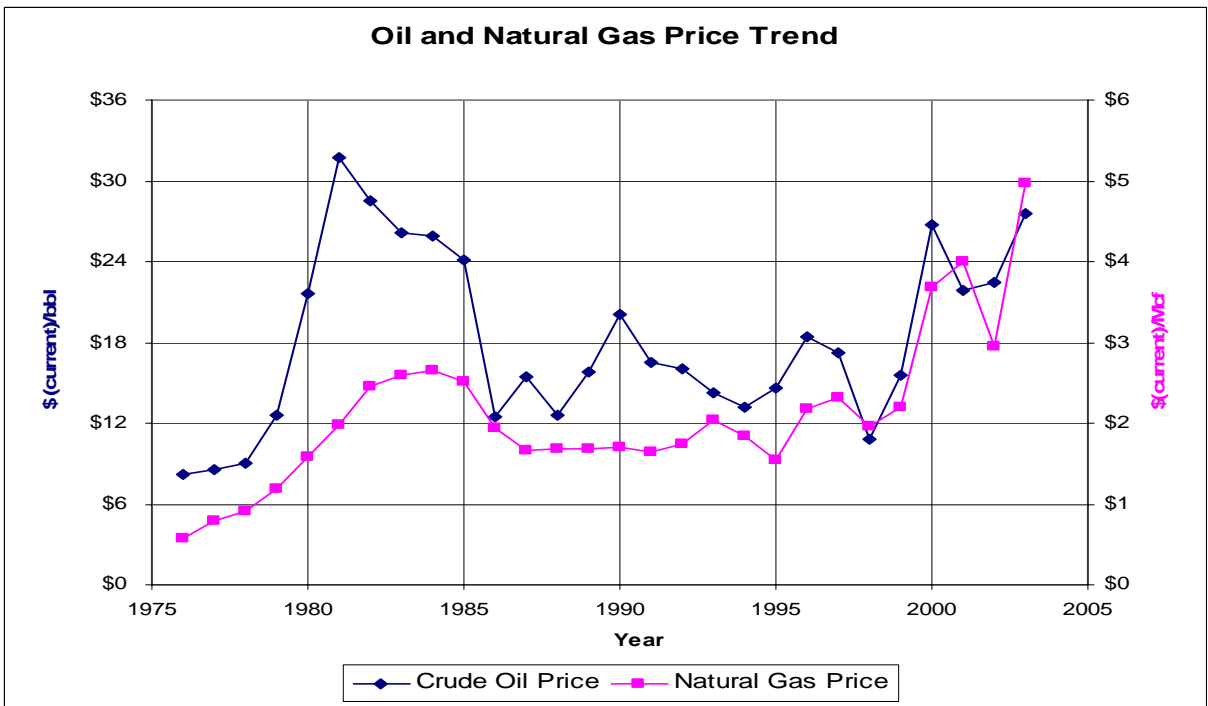


Fig 18 – Oil and natural gas prices trend.

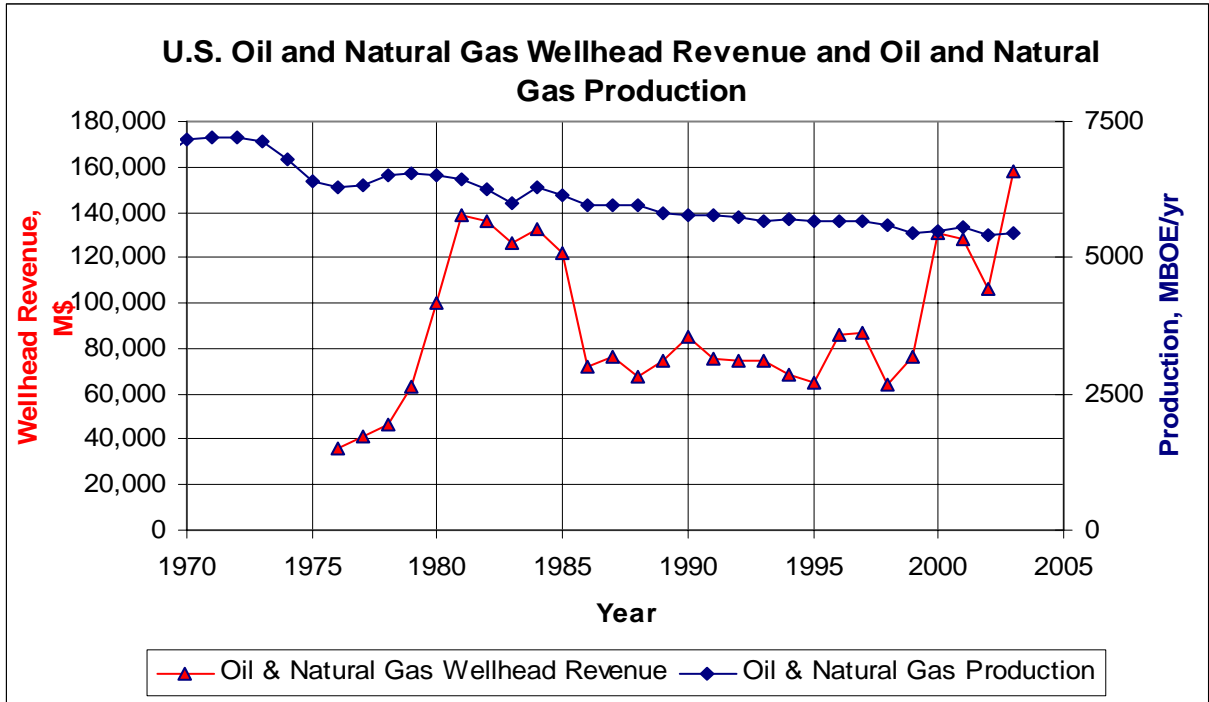


Fig 19 – U.S. oil and natural gas wellhead revenue and oil and natural gas production.

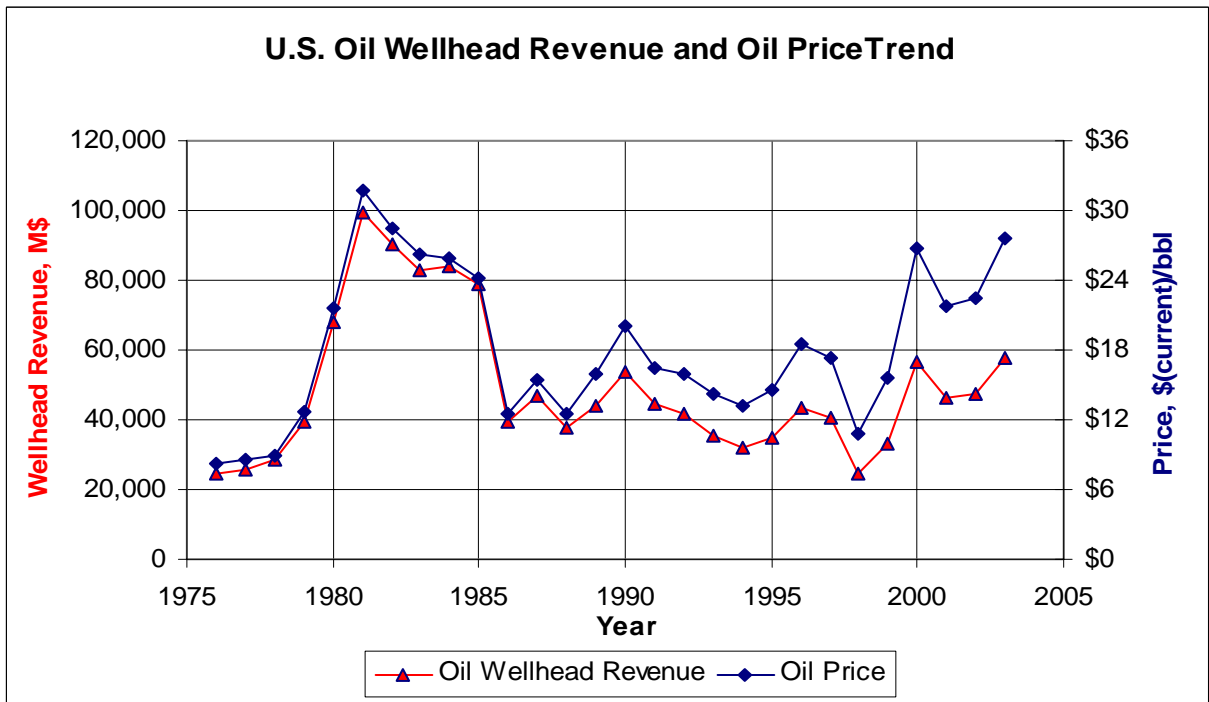


Fig 20 – U.S. oil wellhead revenues with oil prices.

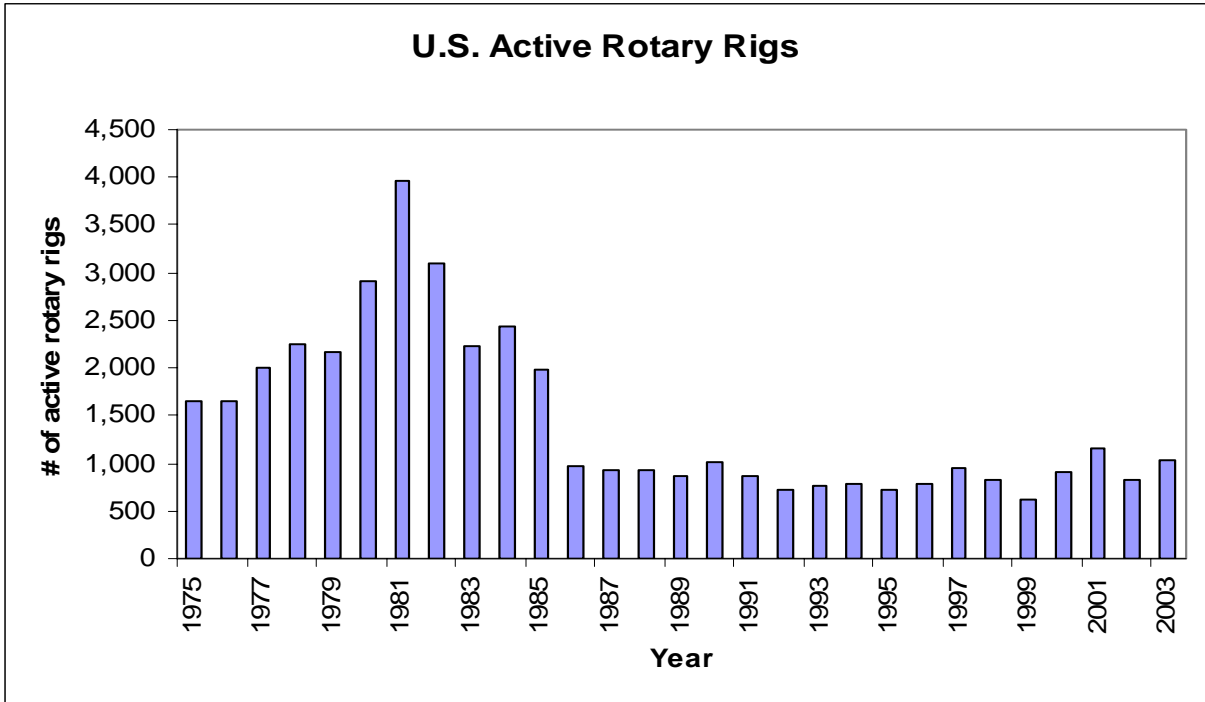


Fig 21 – Average number of active rotary rigs in the U.S. over time.

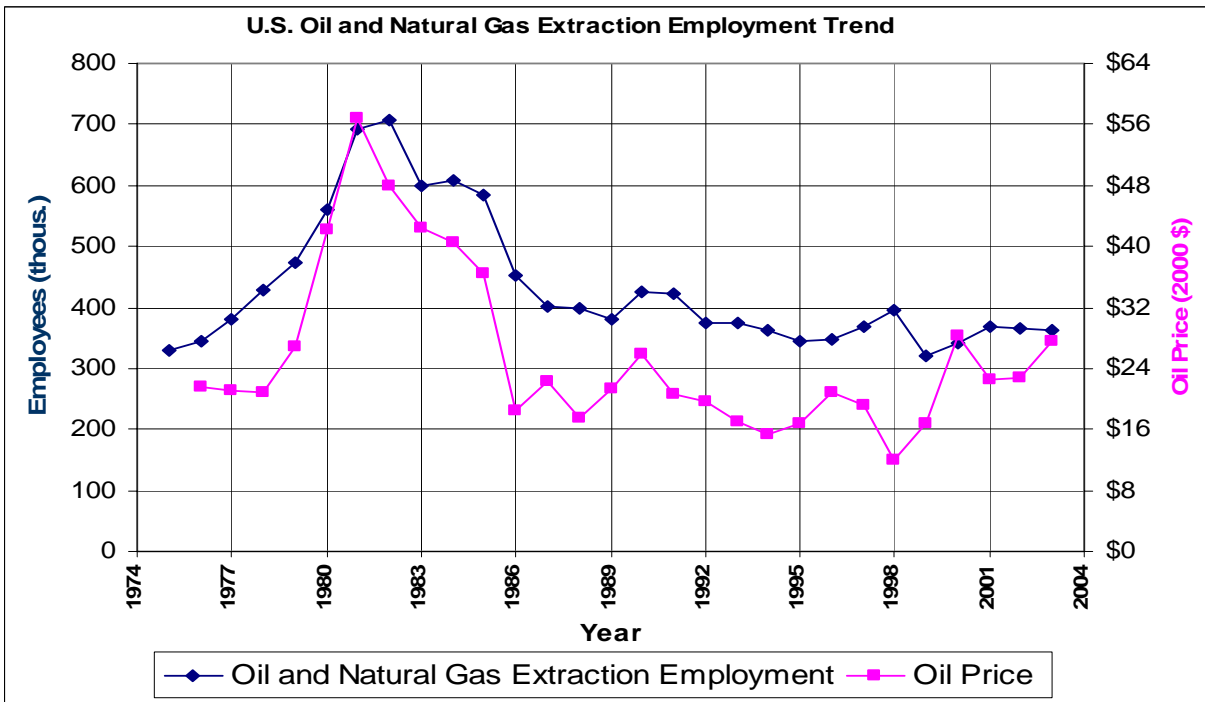


Fig 22 – Oil and natural gas extraction employment trend w/ oil price.

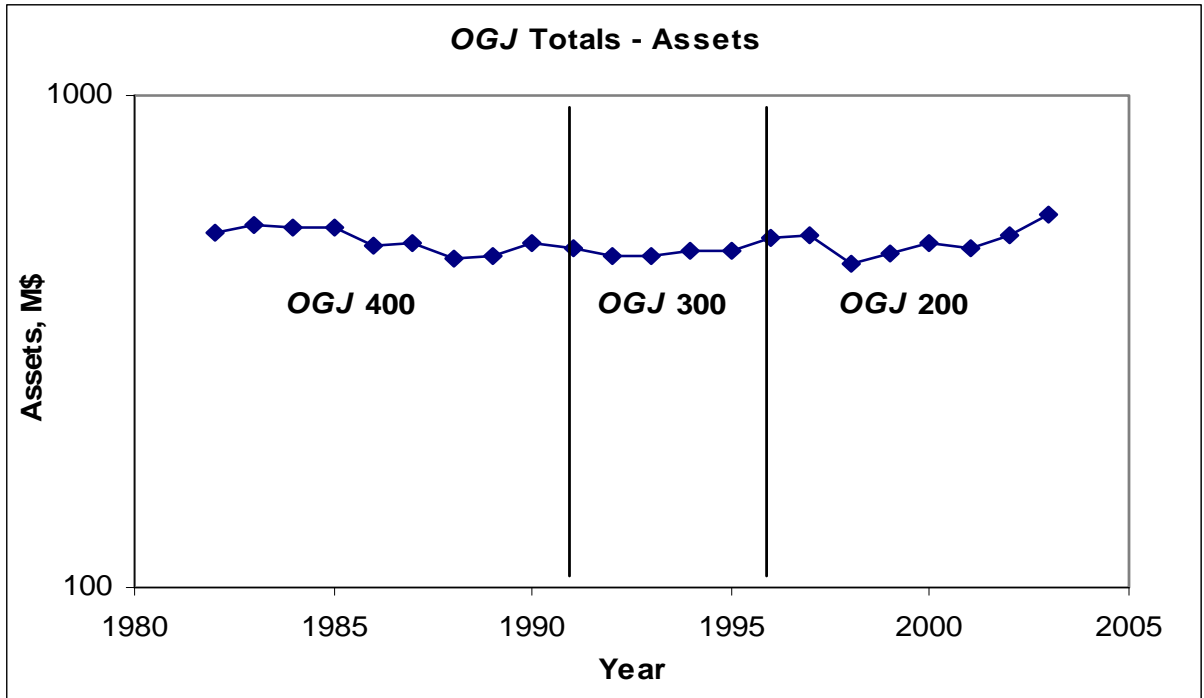


Fig 23 – Assets trend for *OGJ* group list.

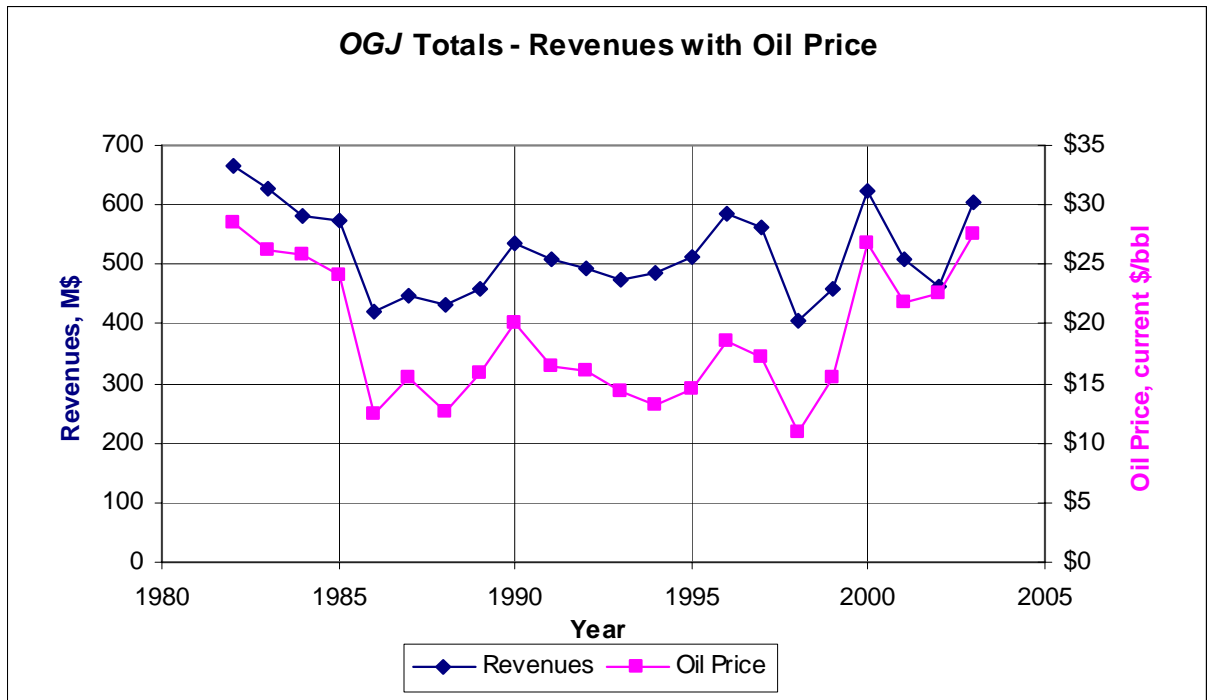


Fig 24 – *OGJ* group revenues with oil price.

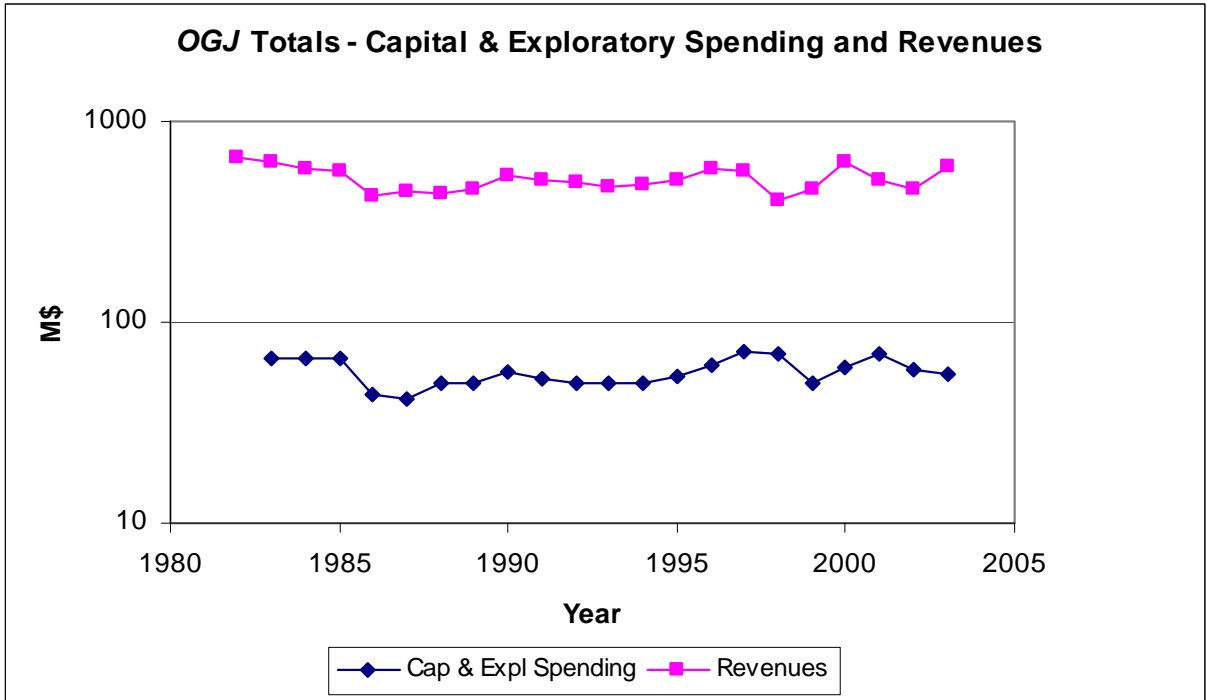


Fig 25 - OGJ group capital and exploratory spending with revenues.

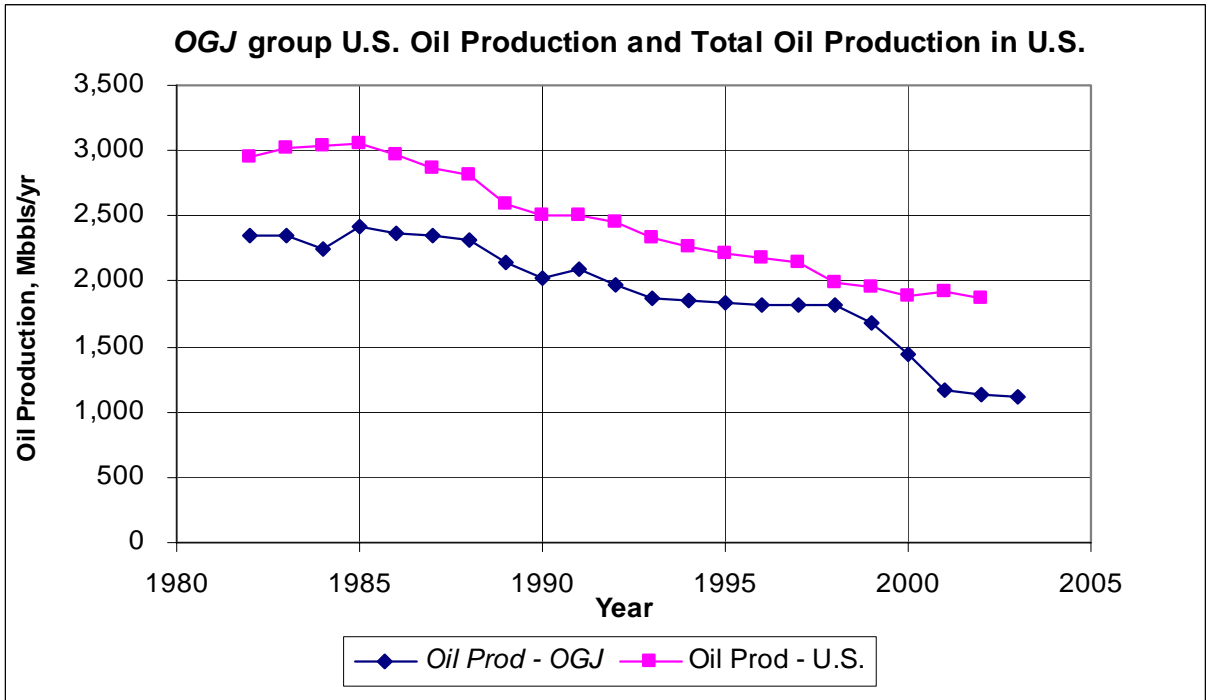


Fig 26 - OGJ group U.S. oil production and total oil production in U.S.

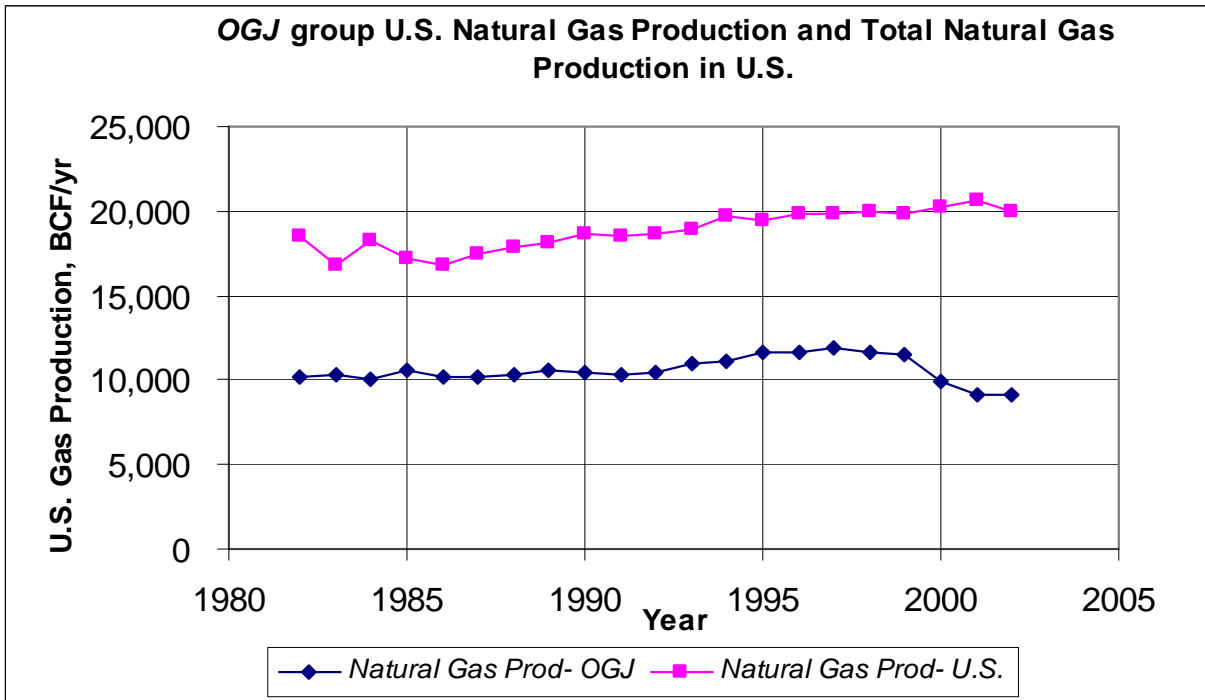


Fig 27 – OGJ group U.S. natural gas production and total natural gas production in U.S.

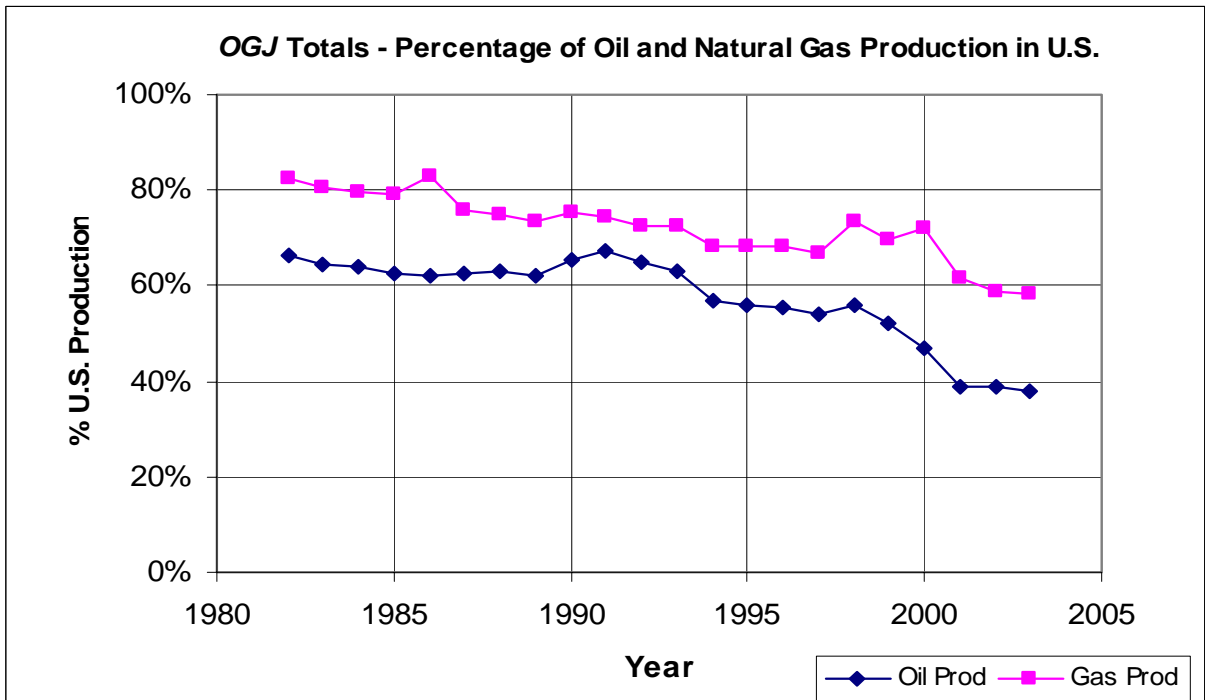


Fig 28 – OGJ group percentage of oil and natural gas production in U.S.

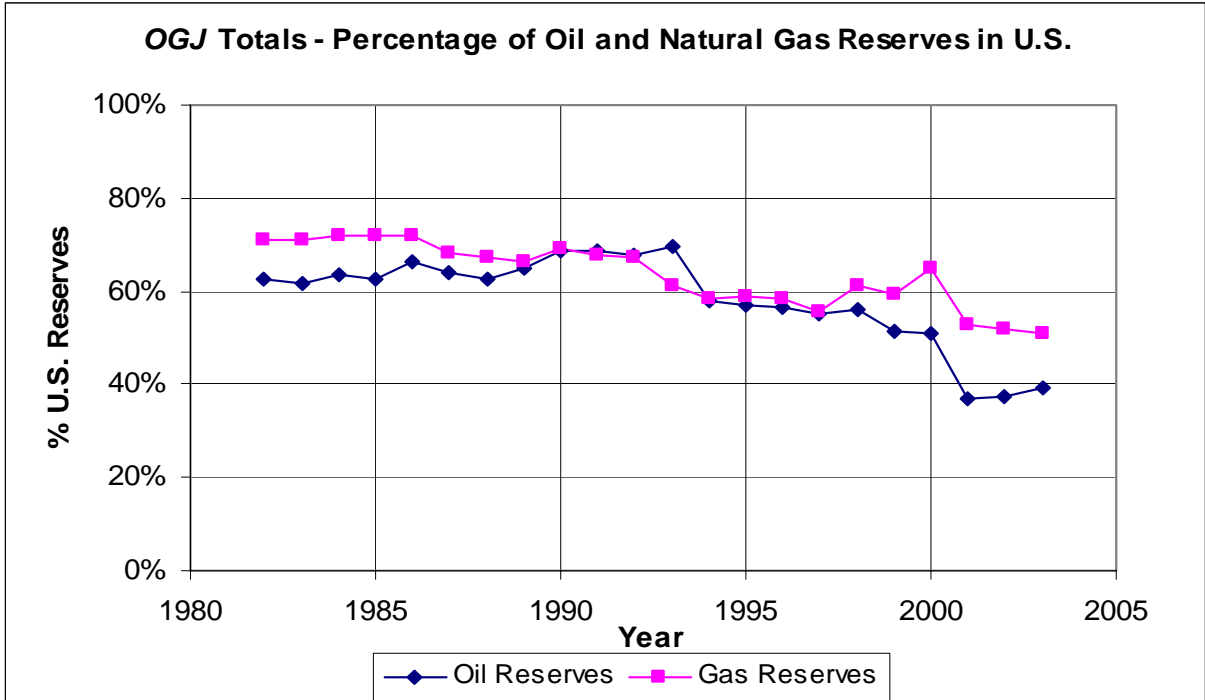


Fig 29 - OGJ group percentage of oil and natural gas reserves in U.S.

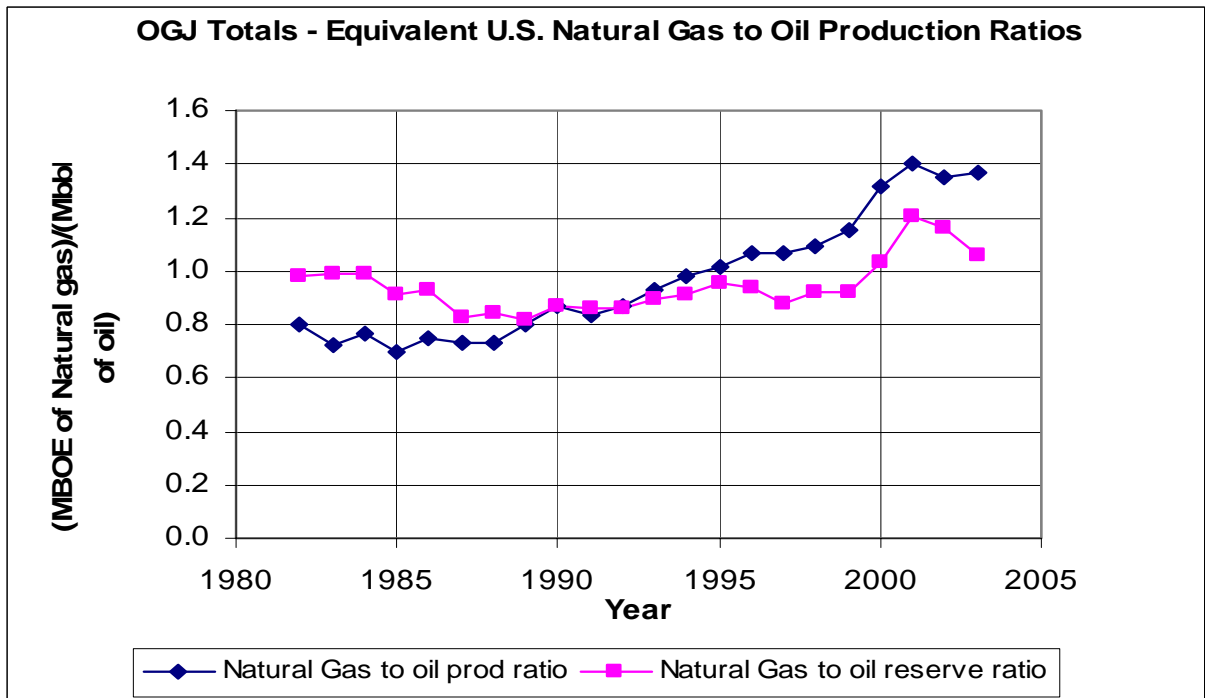


Fig 30 - OGJ group U.S. equivalent natural gas to oil production and reserve ratios.

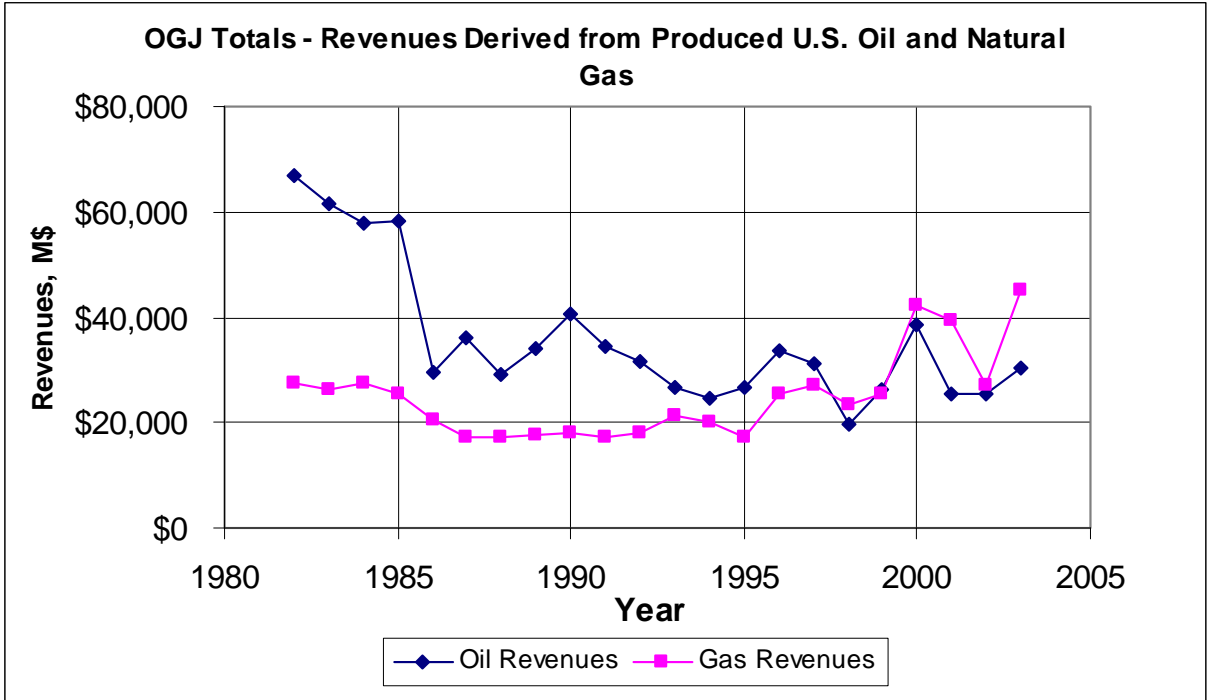


Fig 31 – OGJ group revenues derived from produced U.S. oil and natural gas.

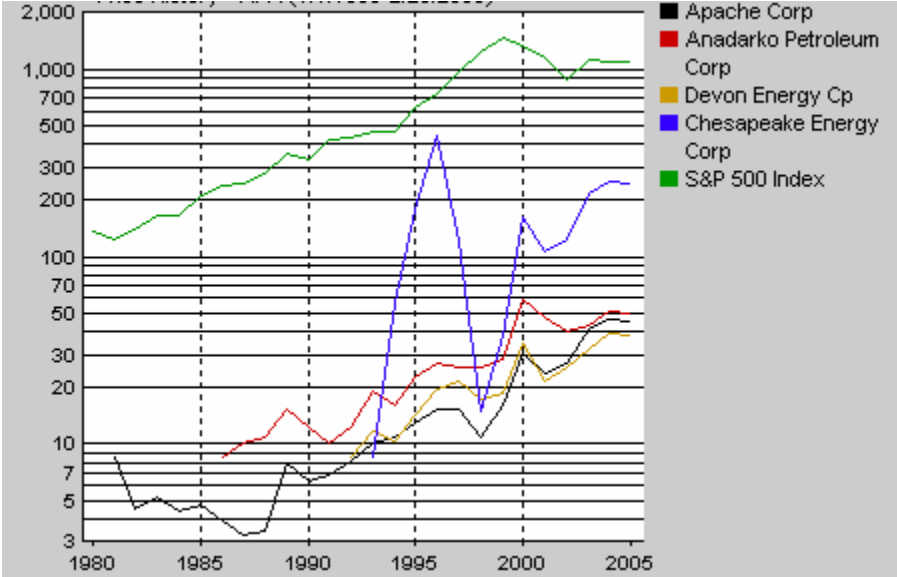


Fig 32 – S&P 500 Index with 4 company stock price history.

APPENDIX A

Apache Corporation

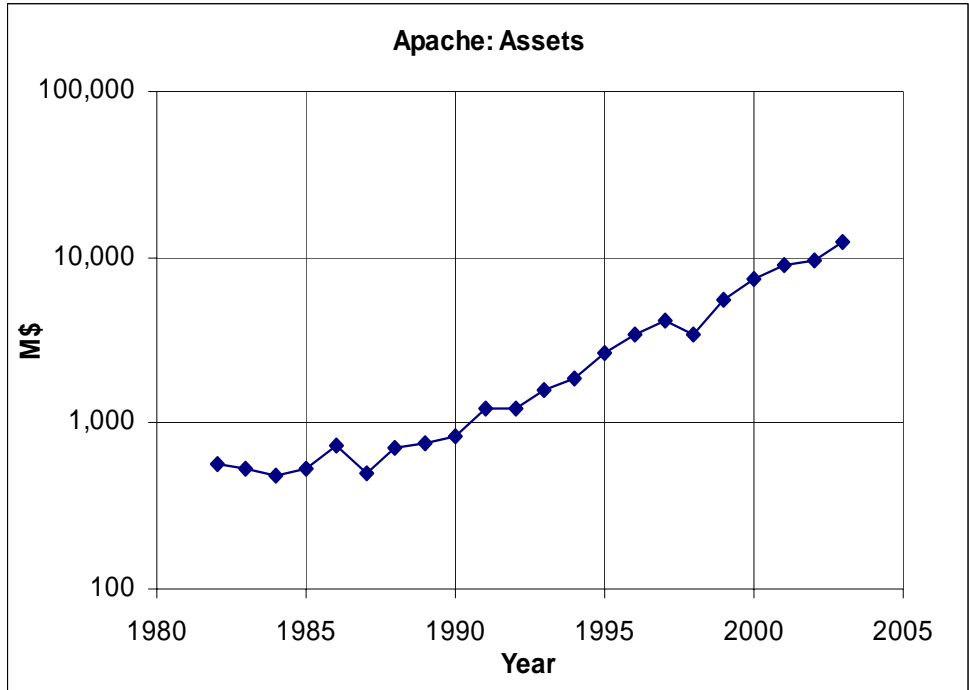


Fig A-1: Apache assets trend.

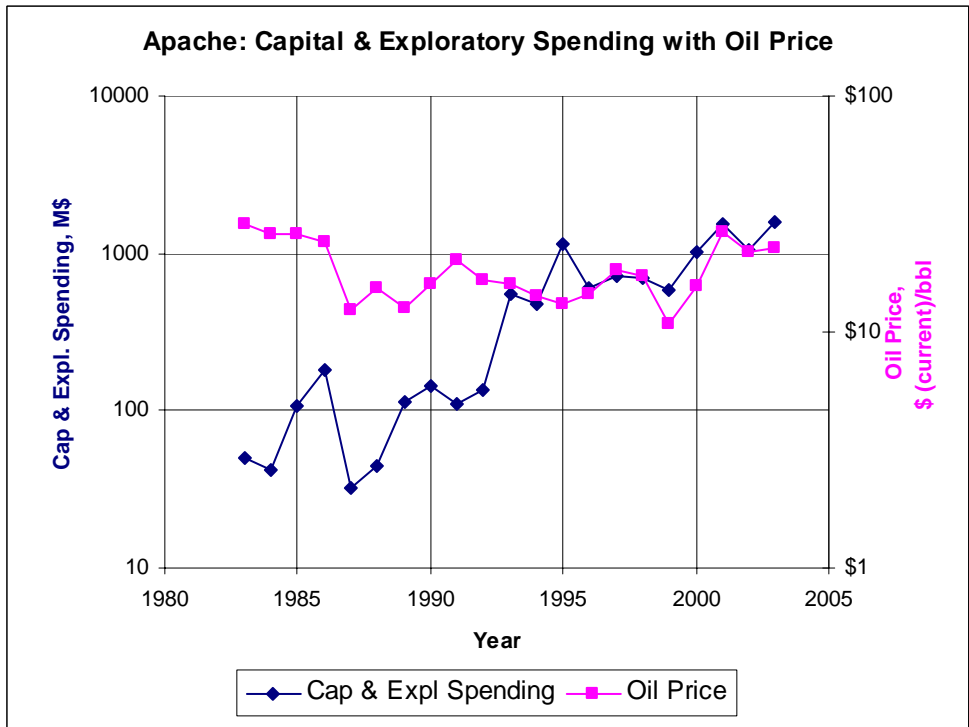


Fig A-2: Apache capital and exploratory spending with oil price.

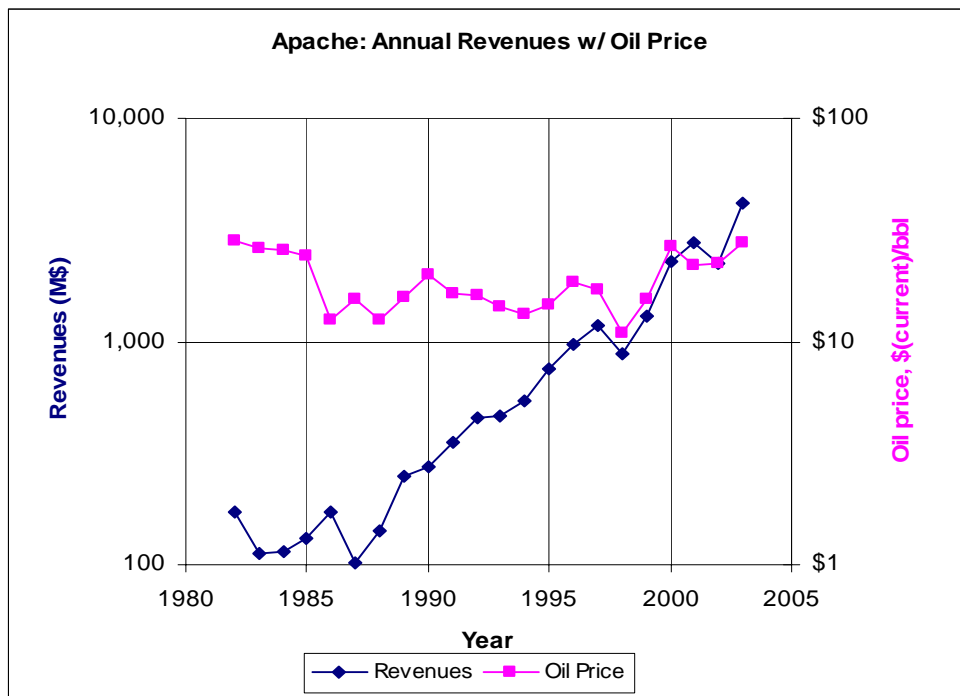


Fig A-3: Apache annual revenues w/ oil prices.

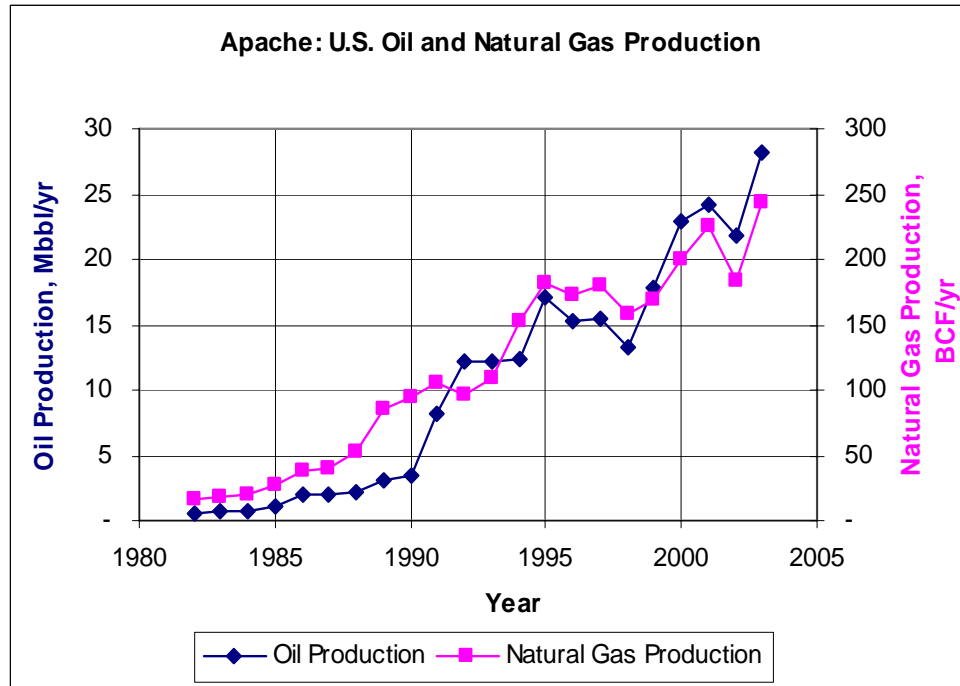


Fig A-4: Apache U.S. oil and natural gas production.

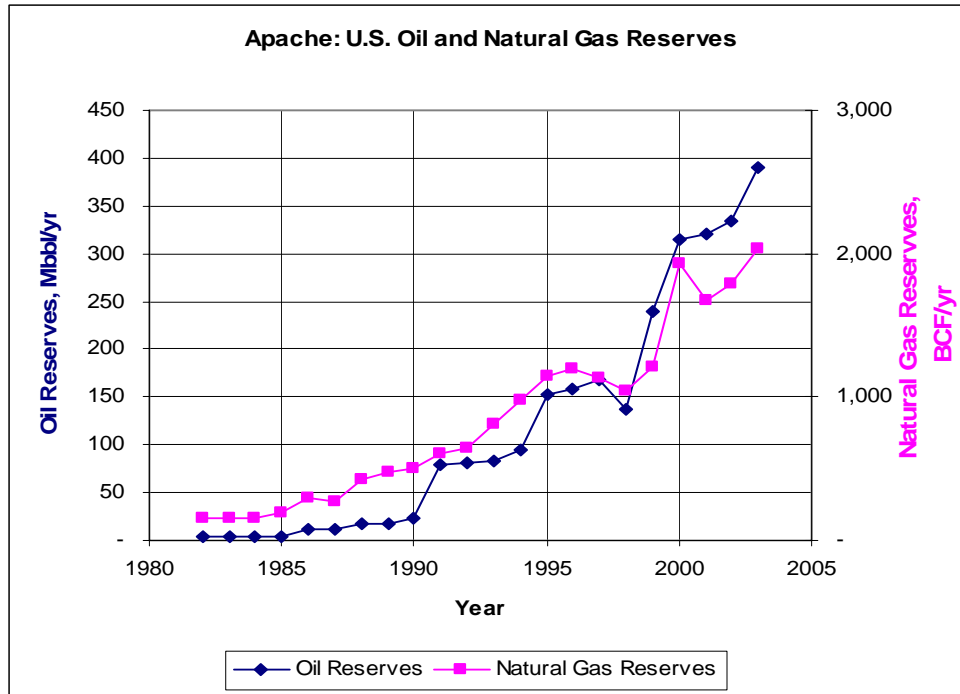


Fig A-5: Apache U.S. oil and natural gas reserves.

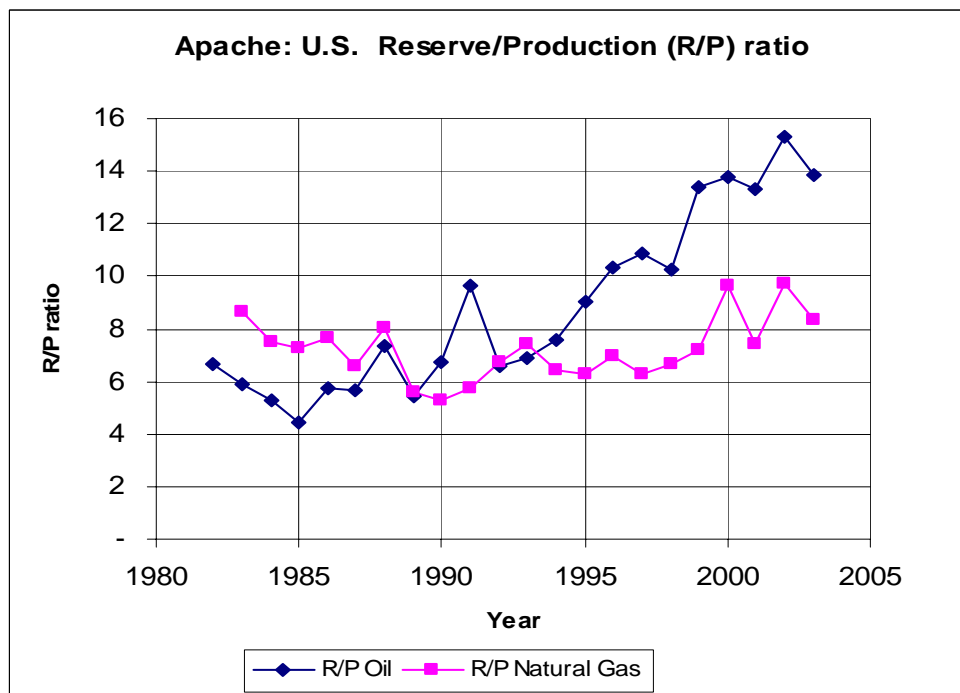


Fig A-6: Apache U.S. R/P ratio.

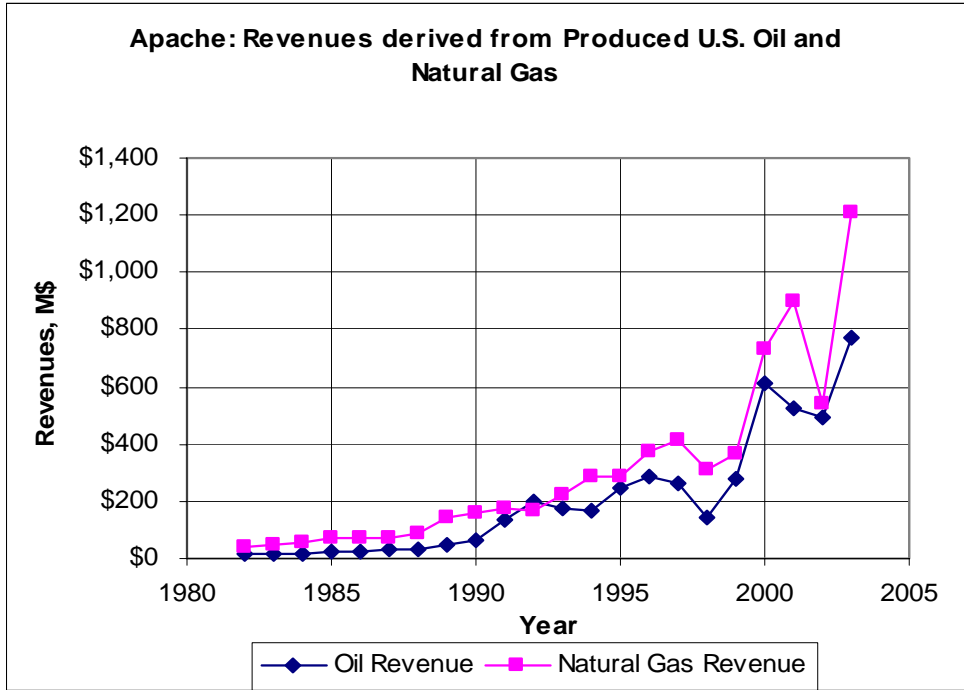


Fig A-7: Apache revenues from U.S. oil and natural gas production.

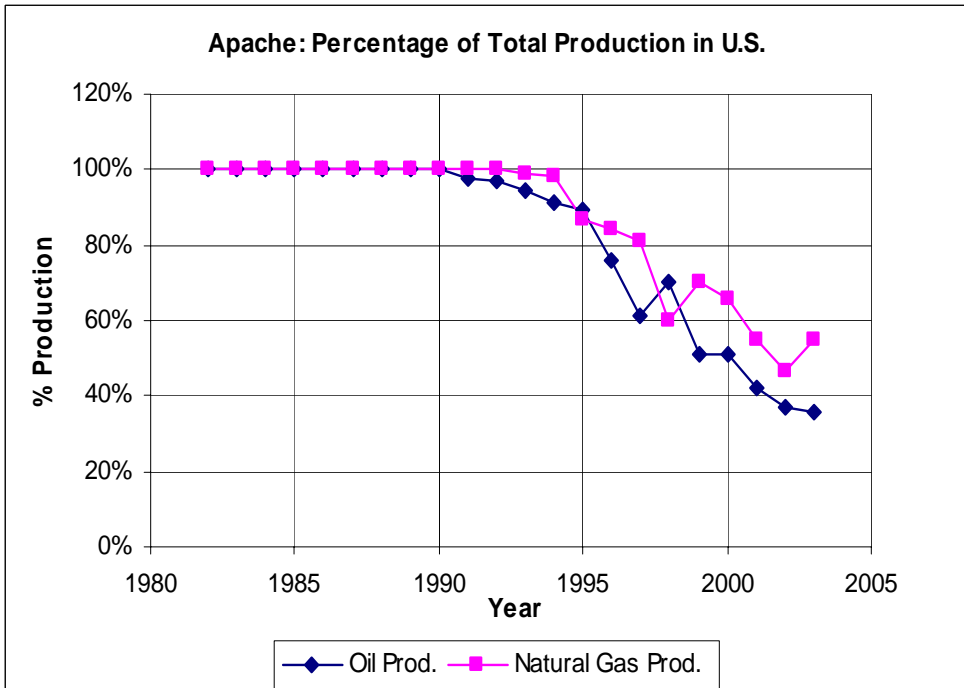


Fig A-8: Percentage of Apache production in the U.S.

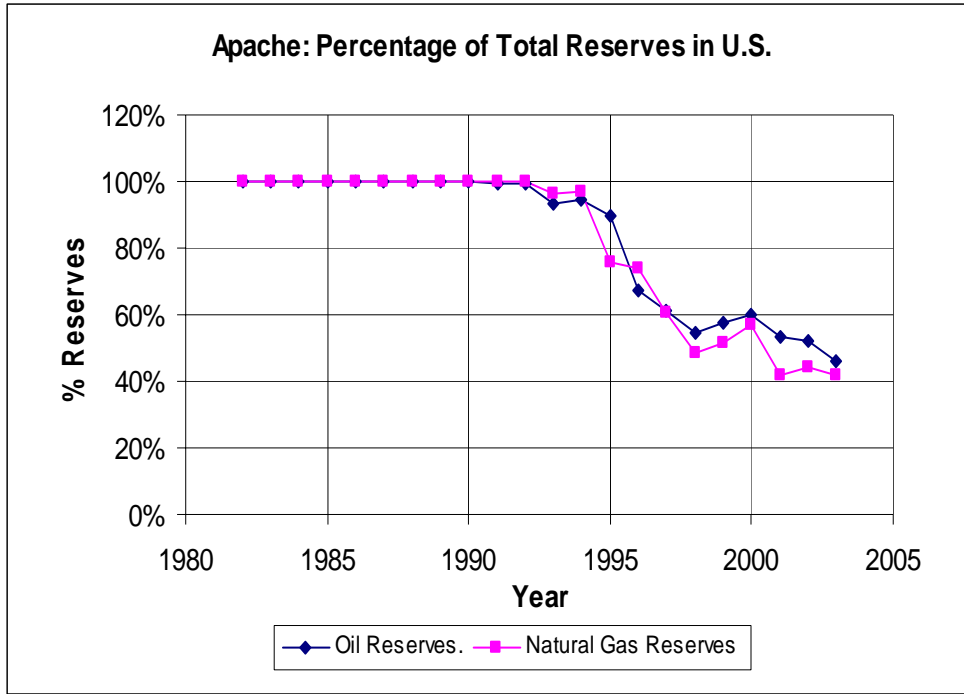


Fig A- 9: Percentage of Apache reserves in the U.S.

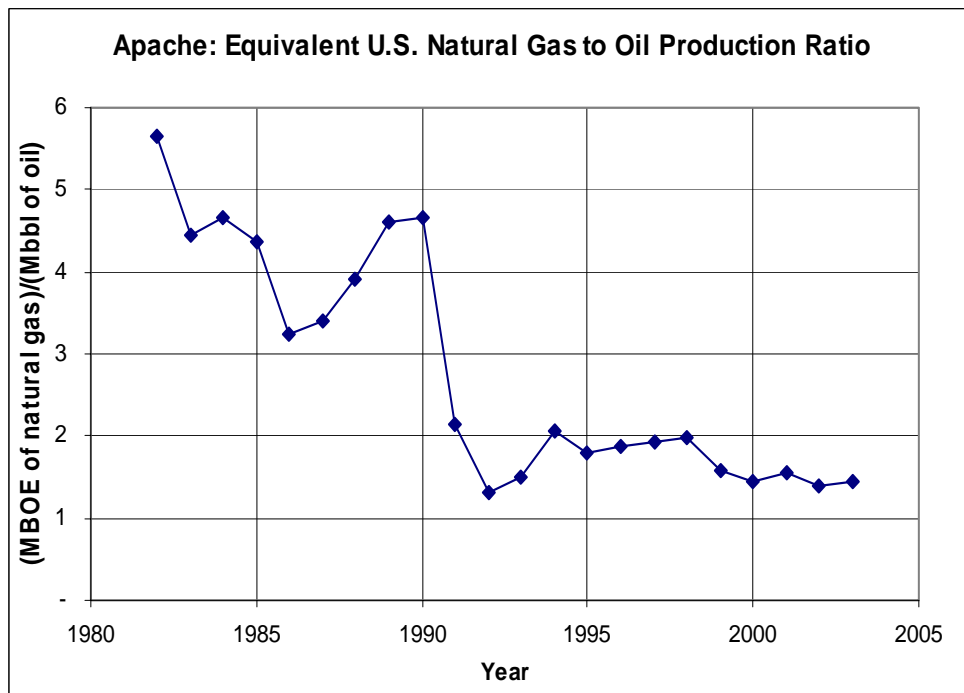


Fig A-10: Apache U.S. equivalent natural gas-oil production ratio.

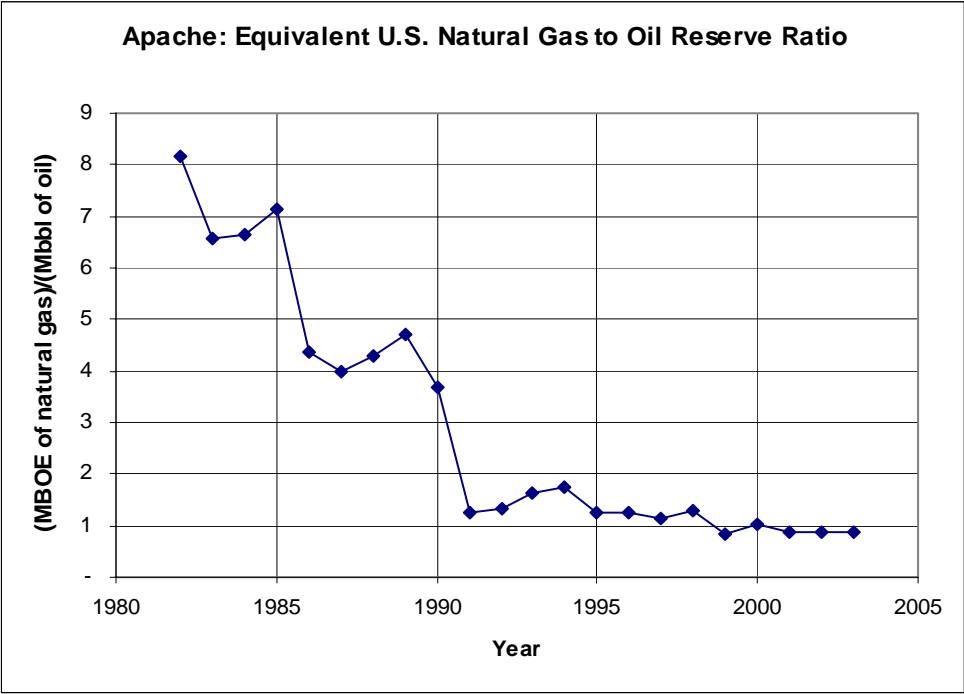


Fig A-11: Apache U.S. equivalent natural gas-oil reserve ratio.

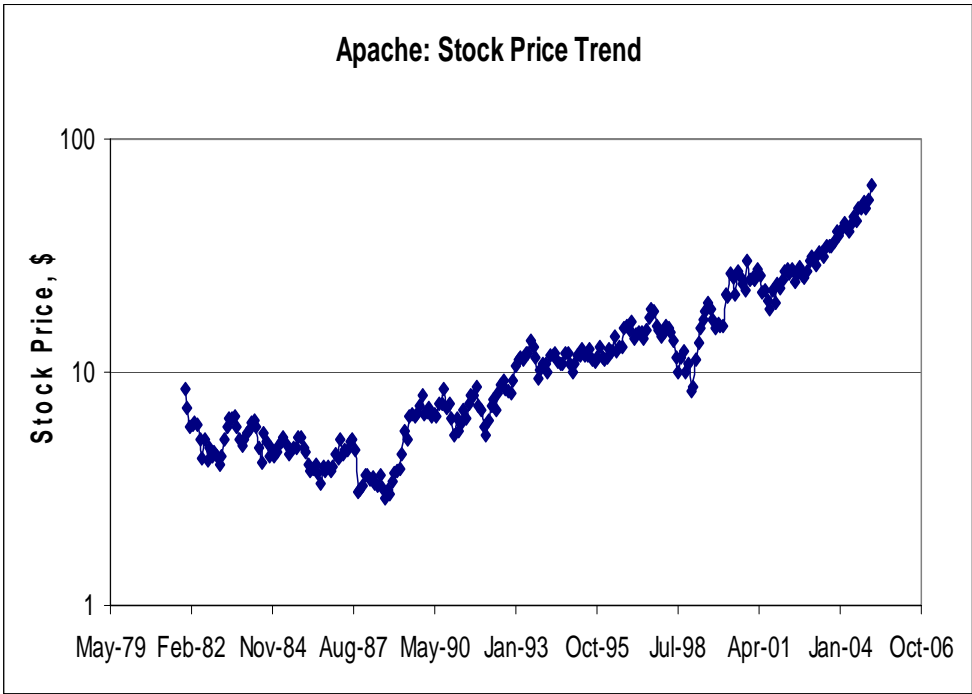


Fig A-12: Apache stock price trend.

Table A-1: Apache's Major M&A activities.

<b>Major Apache activities</b>	
<b>Year</b>	
1980	\$400M, Acquisition from Dow Chemical Company
1984	Shell Joint Venture
1986	\$428M, Acquisition from Occidental, offshore operations
1991	\$546M, Acquisition of MW Petroleum from Amoco (Mid-Continent, Rockies, Gulf Coast, & Permian Basin)
1993	\$98M, Acquisition of Hadson Energy Resources(Offshore Western Australia)
1994	\$285M, Merger with DEKALB Energy Company (Canada)
1995	\$576M, Acquisition from Texaco (Permian Basin, TX-LA gulf coast, Western OK, East TX, rocky mountains & GOM)
1996	Merger with The Phoenix Resource Company (Egypt)
1999	\$714M, Acquisition from Shell (GOM properties)
2001	\$410M, Acquisition from Repsol (Egypt)
	Acquisition from Fletcher Challenge Energy (Canada & Argentina)
2003	\$1.3B, Acquisition from BP (Gulf and UK North Sea)

APPENDIX B

Anadarko Corporation

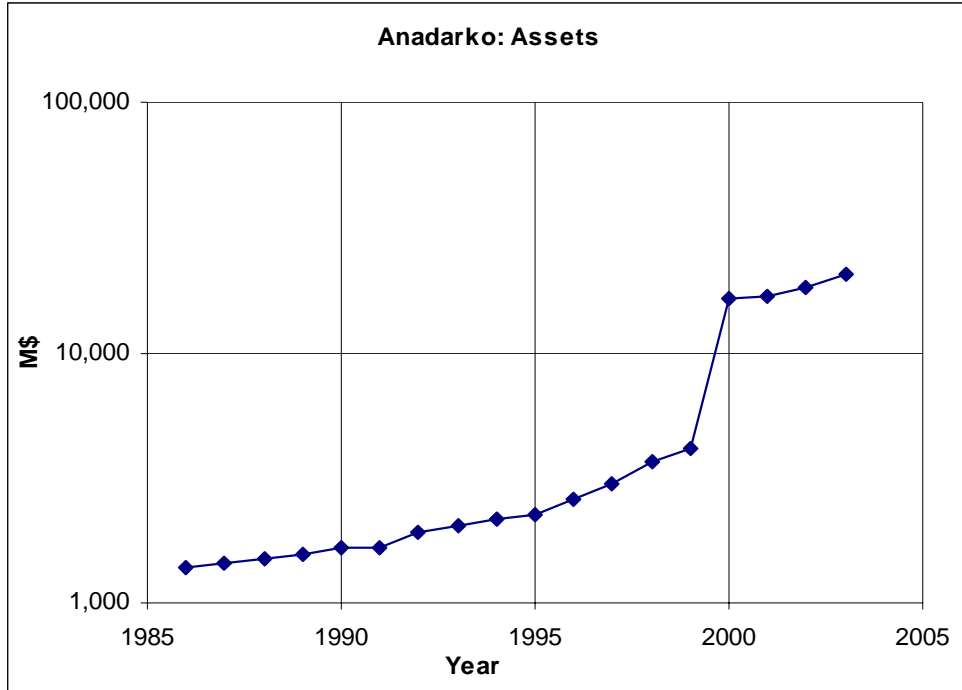


Fig B-1: Assets Trend.

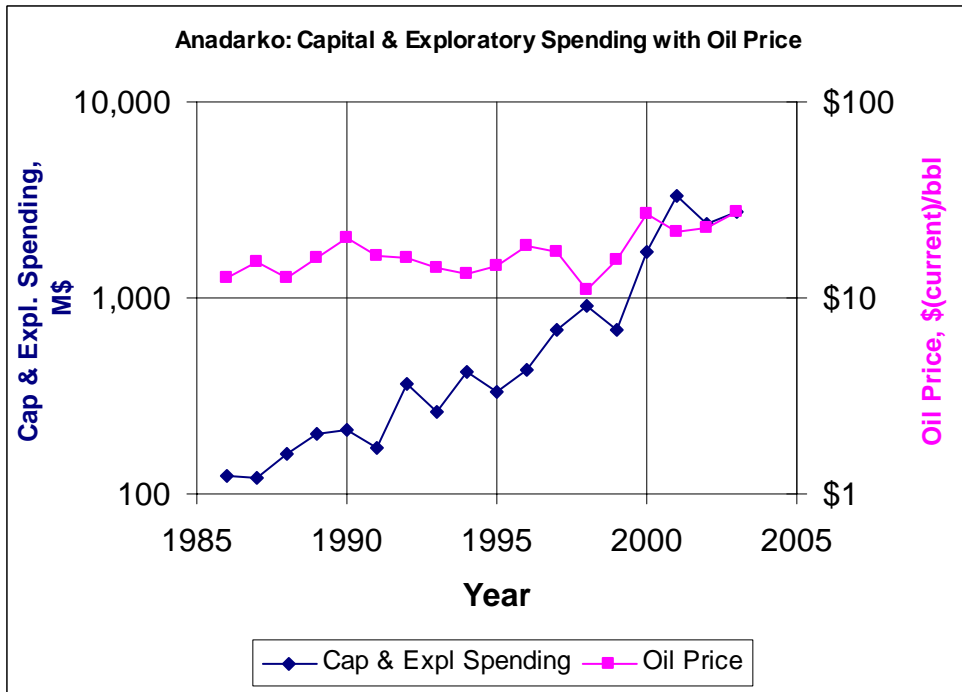


Fig B-2: Anadarko capital and exploratory spending w/ oil price.

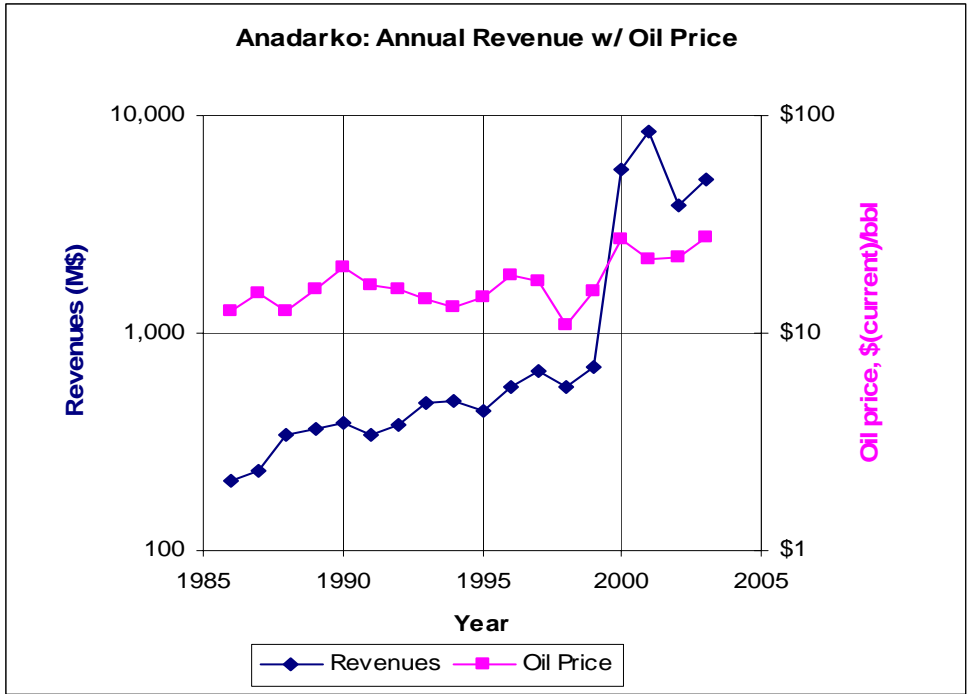


Fig B-3: Anadarko annual revenue w/ oil prices.

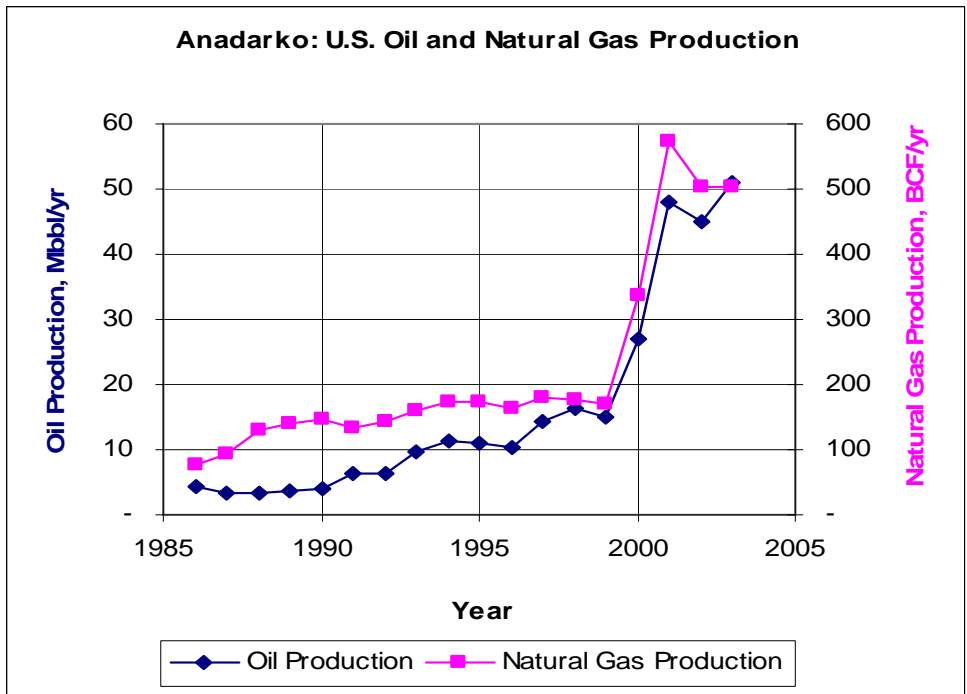


Fig B-4: Anadarko U.S. oil and natural gas production.

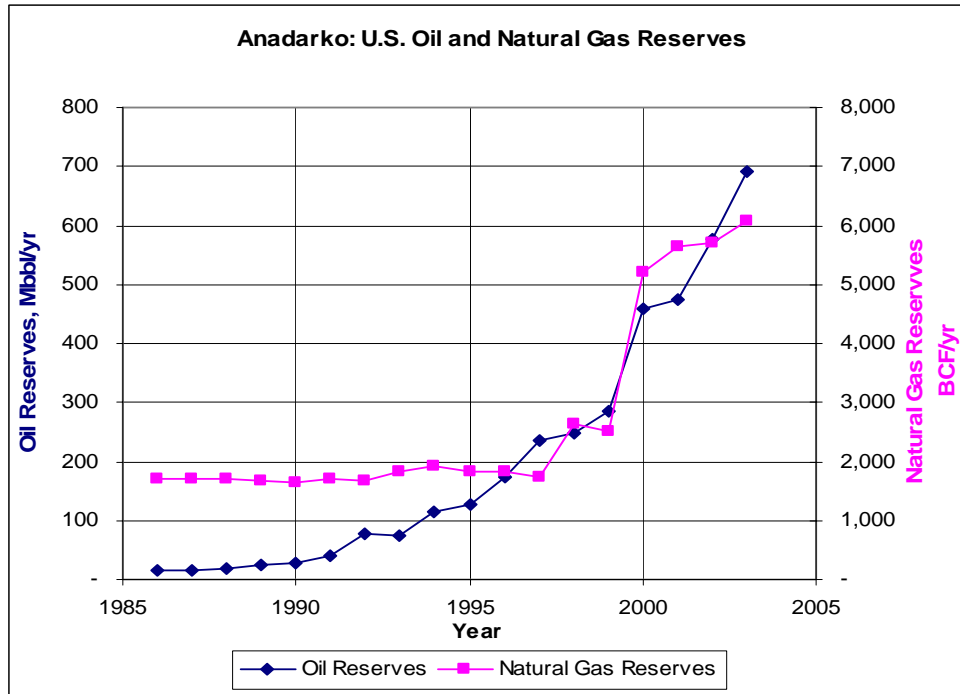


Fig B-5: Anadarko U.S. oil and natural gas reserves.

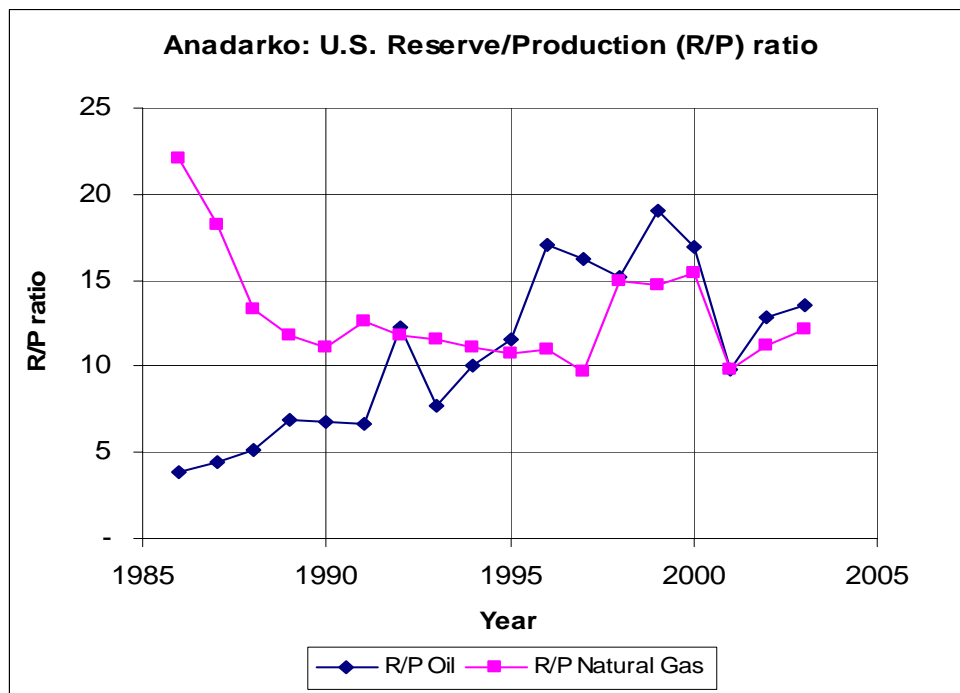


Fig B-6: Anadarko U.S. R/P ratio.

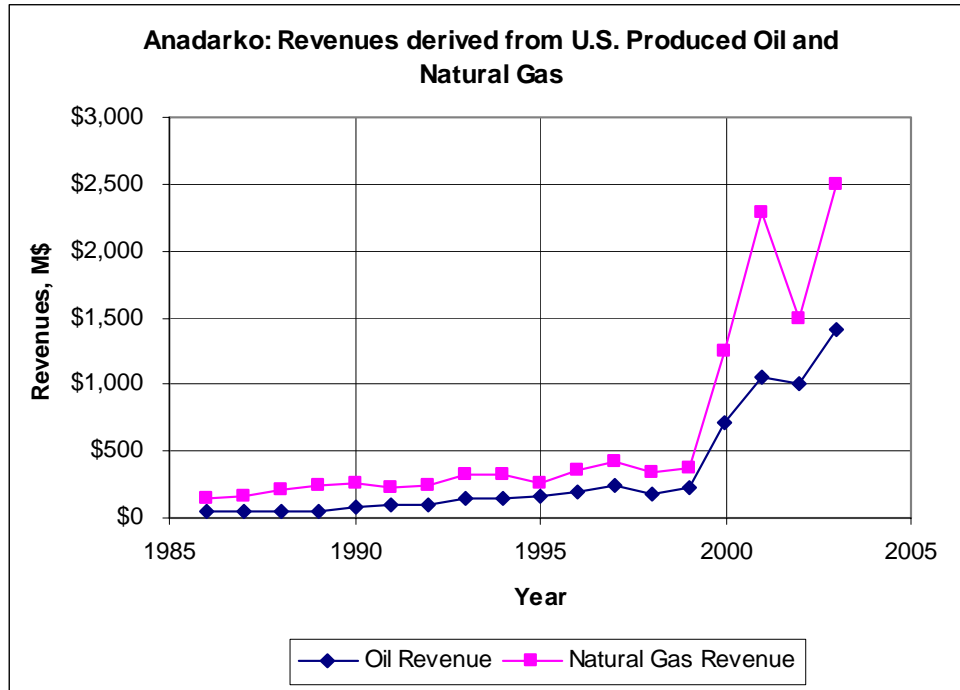


Fig B-7: Anadarko revenues from U.S. oil and natural gas production.

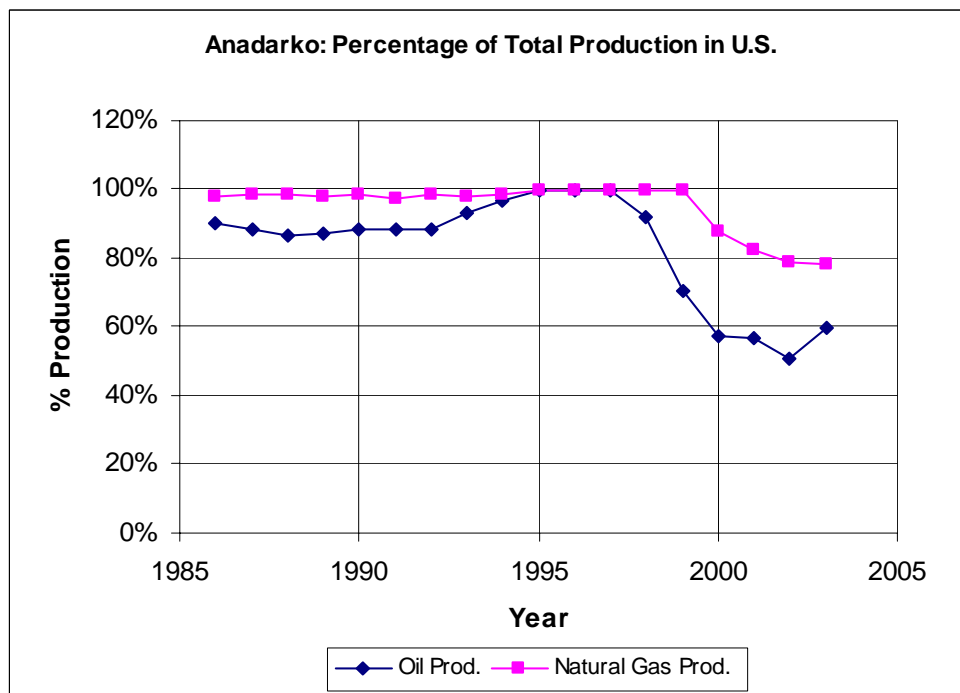


Fig B-8: Percentage of Anadarko production in the U.S.

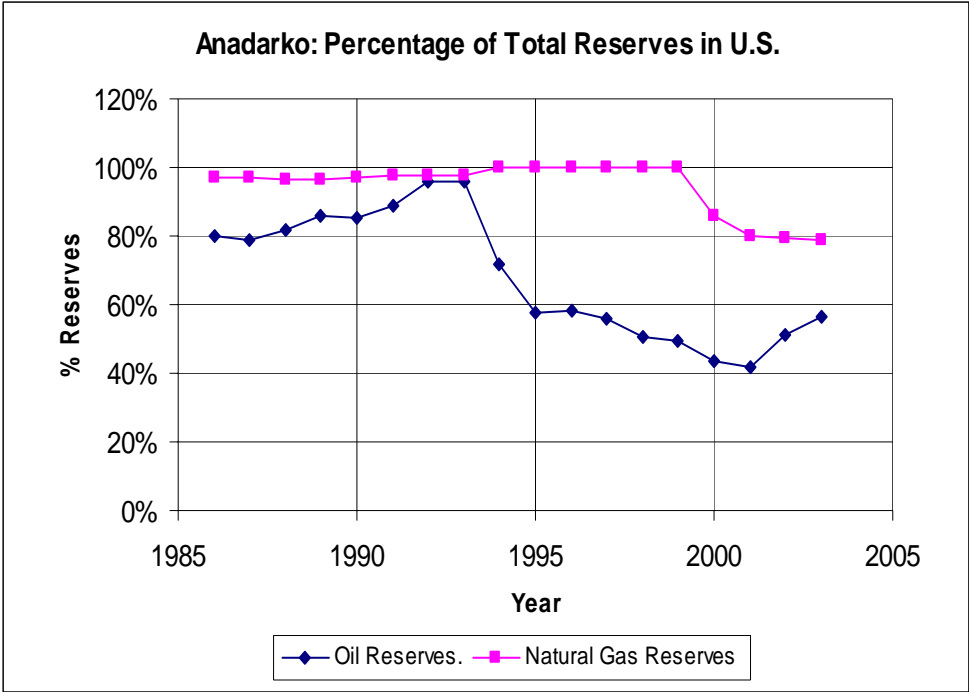


Fig B- 9: Percentage of Anadarko reserves in the U.S.

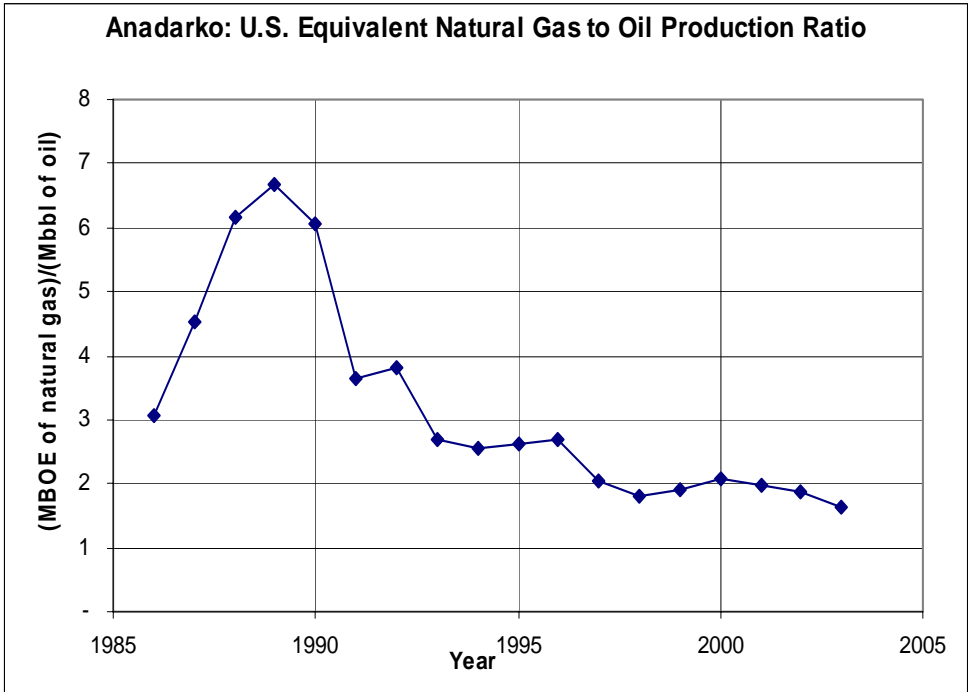


Fig B-10: Anadarko U.S. equivalent natural gas-oil production ratio.

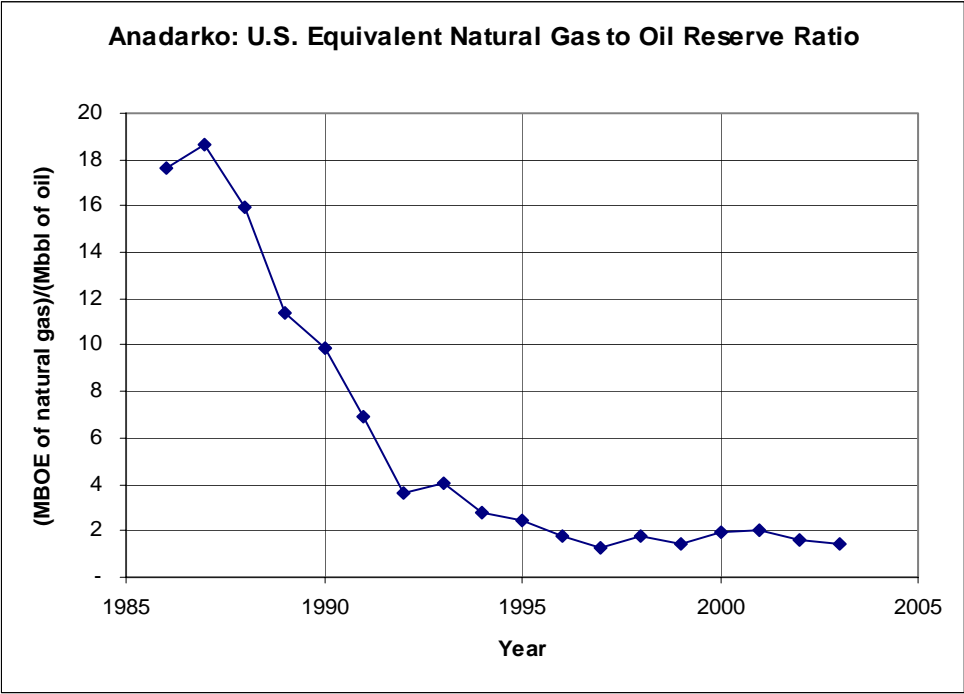


Fig B-11: Anadarko equivalent U.S. natural gas-oil reserve ratio.

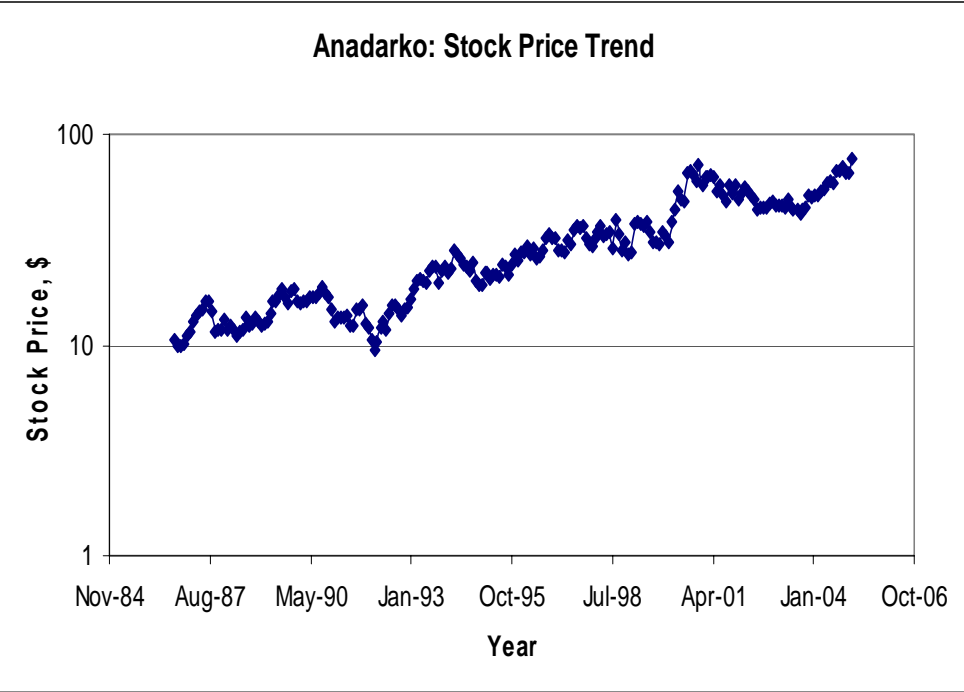


Fig B-12: Anadarko stock price trend.

Table B-1: Anadarko's major M&A activities.

<b>Major Anadarko activities</b>	
<b>Year</b>	<b>Company</b>
1989	PSA w/ SONATRACH (Algeria)
1992	\$200M, Acquisition of assets from Permian basin
1995	Exploration Agreement w/Enitrea (Indonesia)
1996	Exploration pacts (Jordan, Peru)
	Alliance with Mobil (Hugoton Embayment)
1997	Acerage Acquisition (Tunisia and North Atlantic Margin)
1998	Acerage Acquisition in Alaska
1999	Acquisition from Texaco (GOM)
	Merger with Union Pacific Resources (North America)
2000	PSA w/ former Soviet Republic of Georgia
2001	\$1B, Acquisition of Berkeley Petroleum Corporation (Canada)
2002	Acquisition of Howell Corporation (Wyoming Salt Creek Field)

APPENDIX C

Chesapeake Corporation

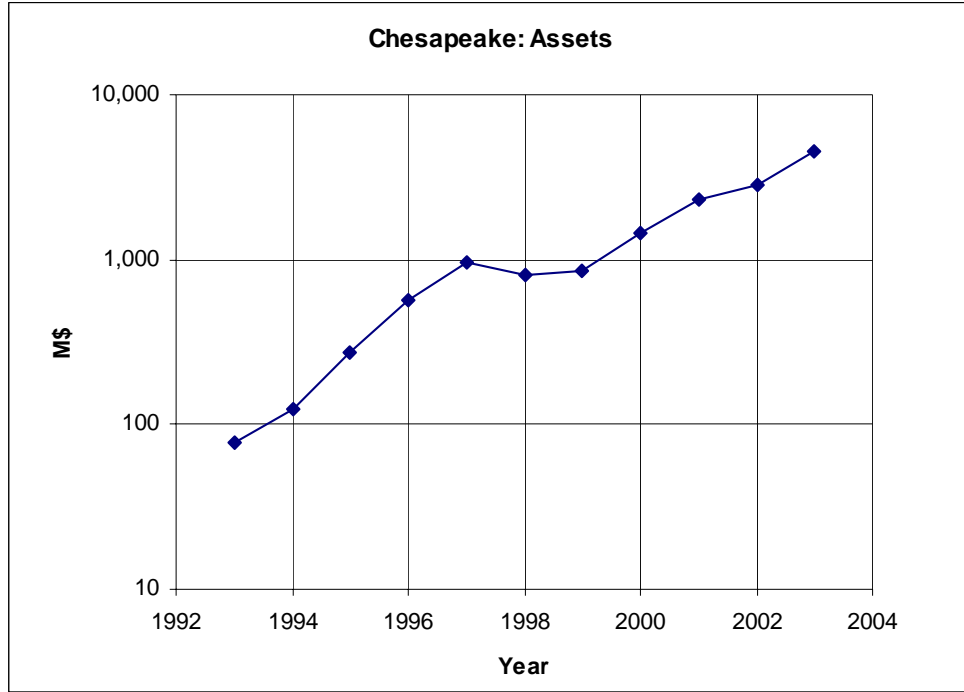


Fig C-1: Chesapeake assets trend.

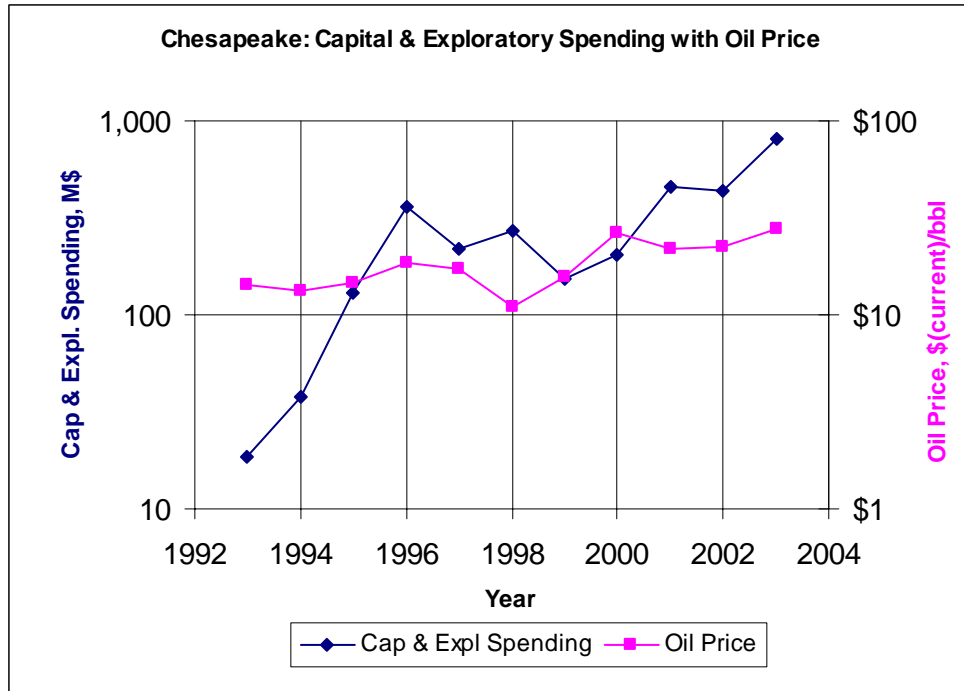


Fig C-2: Chesapeake capital and exploratory spending with oil price.

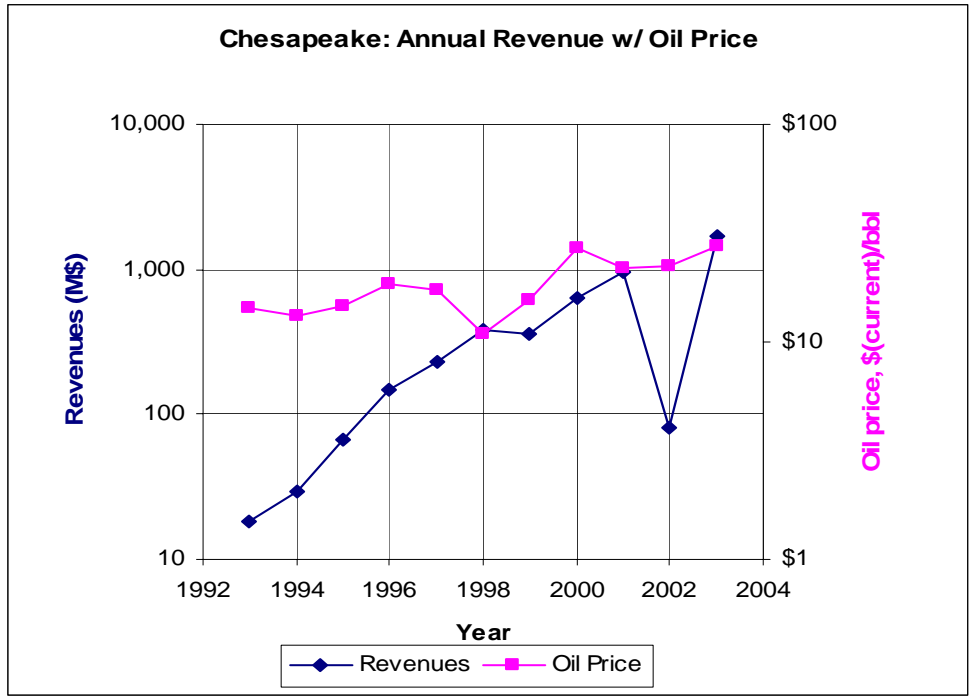


Fig C-3: Chesapeake annual revenue w/ oil price.

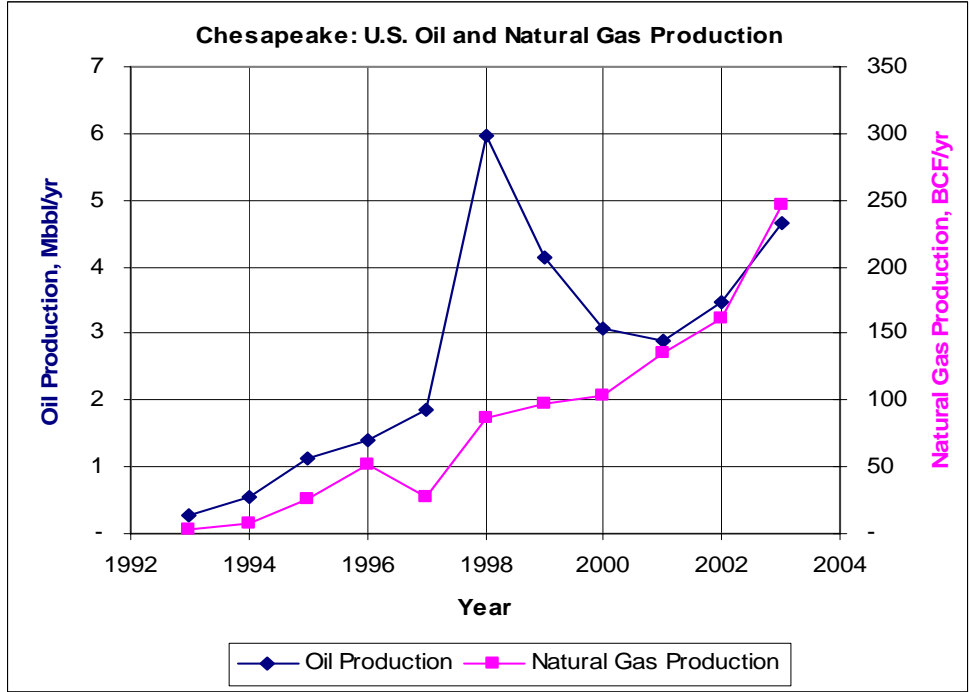


Fig C-4: Chesapeake U.S. oil and natural gas production.

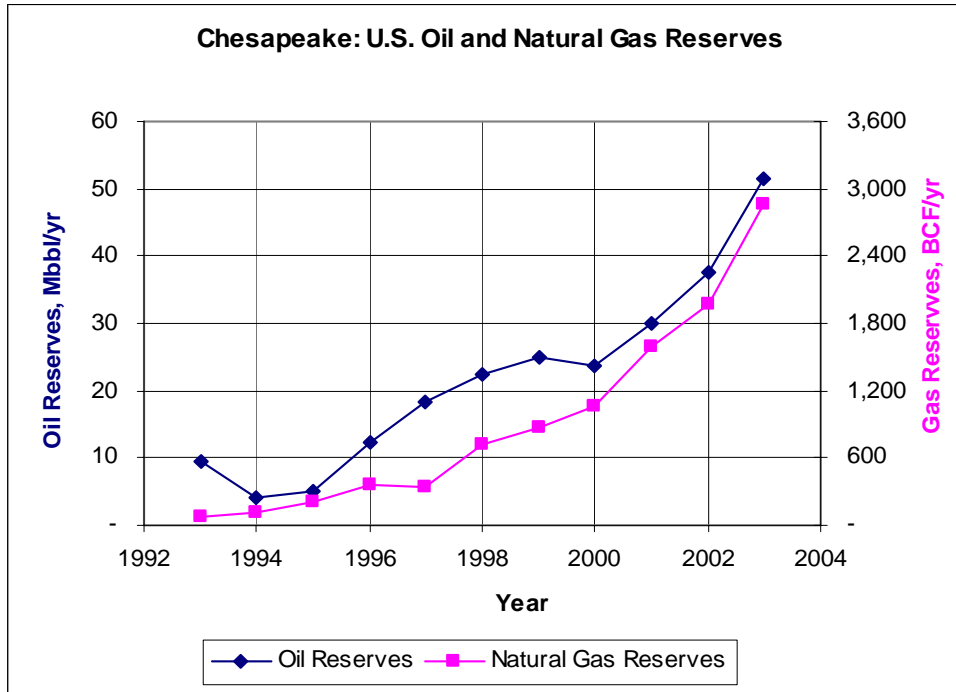


Fig C-5: Chesapeake U.S. oil and natural gas reserves.

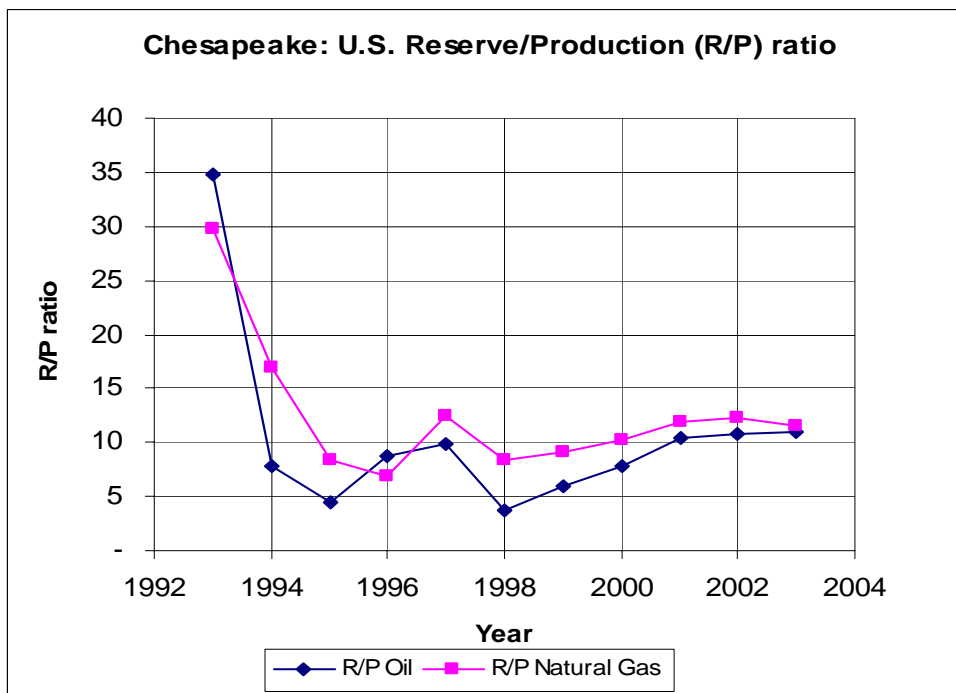


Fig C-6: Chesapeake U.S. R/P ratio.

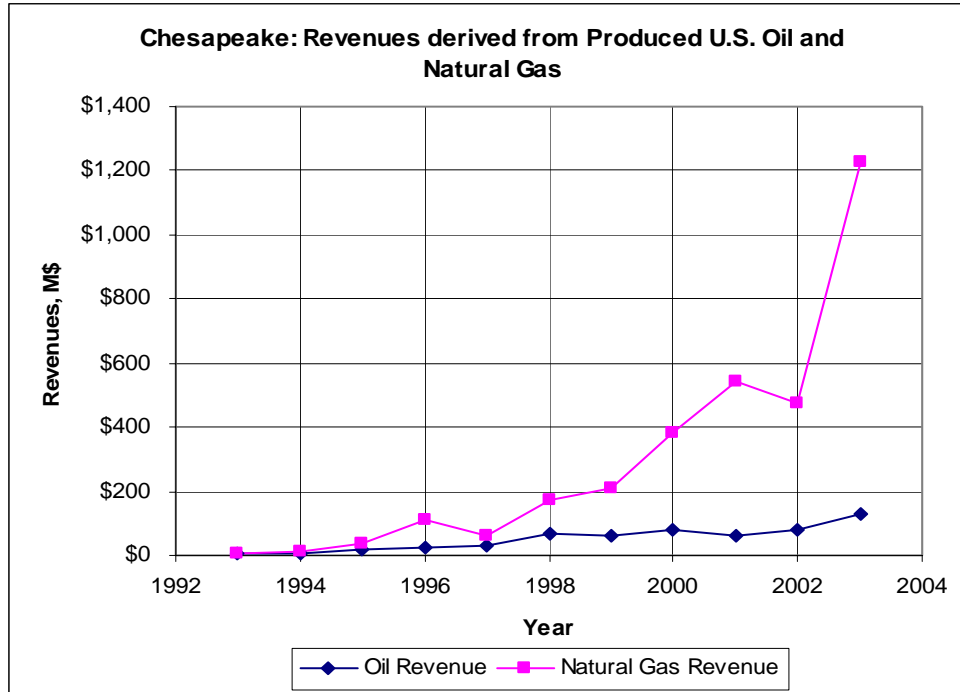


Fig C-7: Chesapeake revenues from U.S. oil and natural gas production.

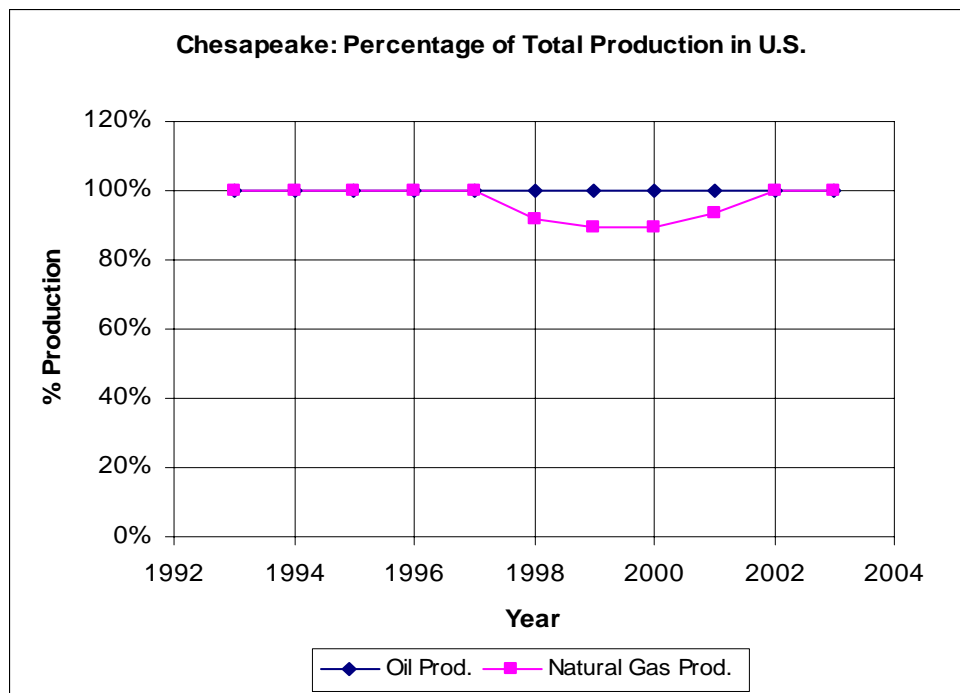


Fig C-8: Percentage of Chesapeake production in the U.S.

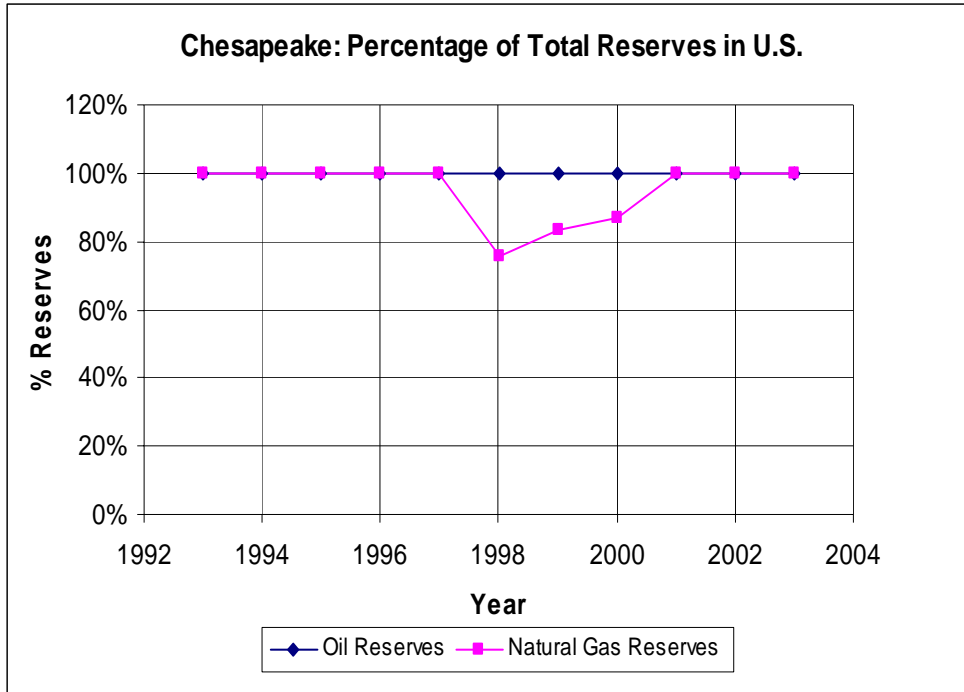


Fig C- 9: Percentage of Chesapeake reserves in the U.S.

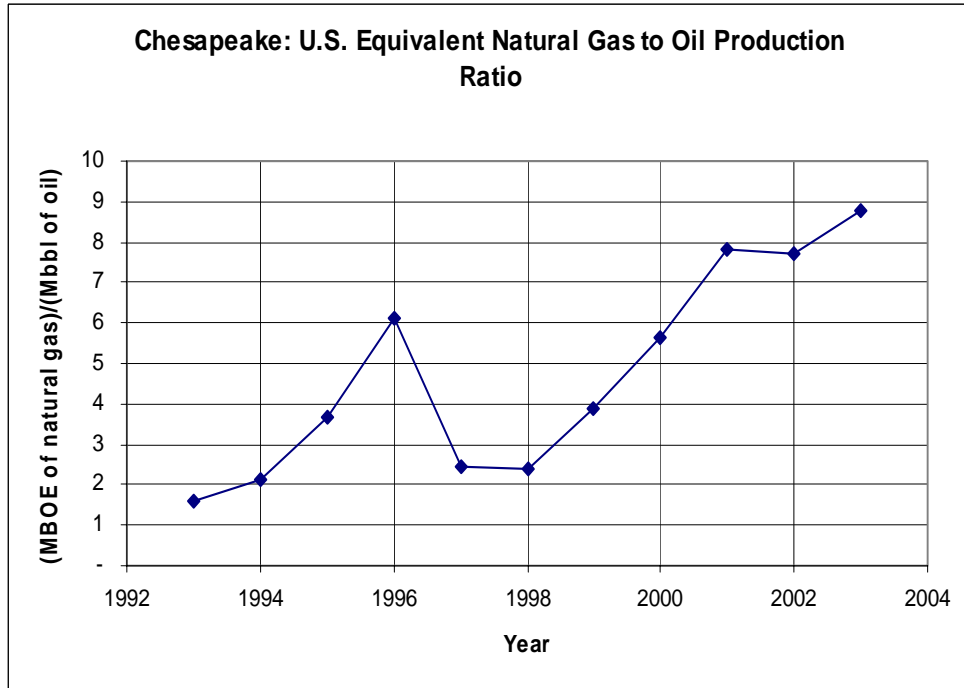


Fig C-10: Chesapeake U.S. equivalent natural gas-oil production ratio.

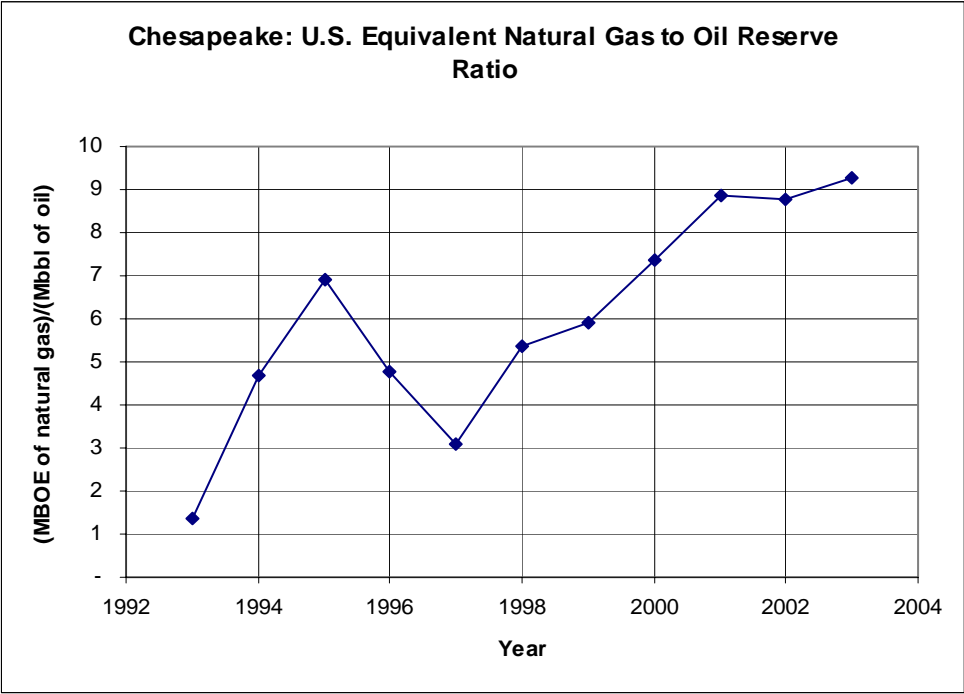


Fig C-11: Chesapeake U.S. equivalent natural gas-oil reserve ratio.

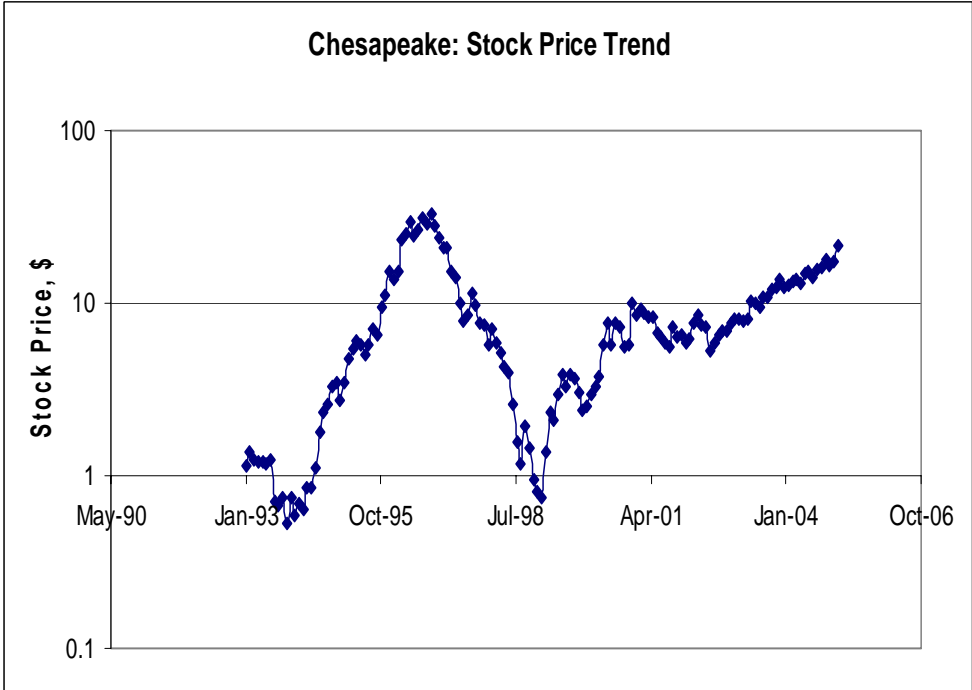


Fig C-12: Chesapeake stock price trend.

APPENDIX D

Devon Energy Corporation

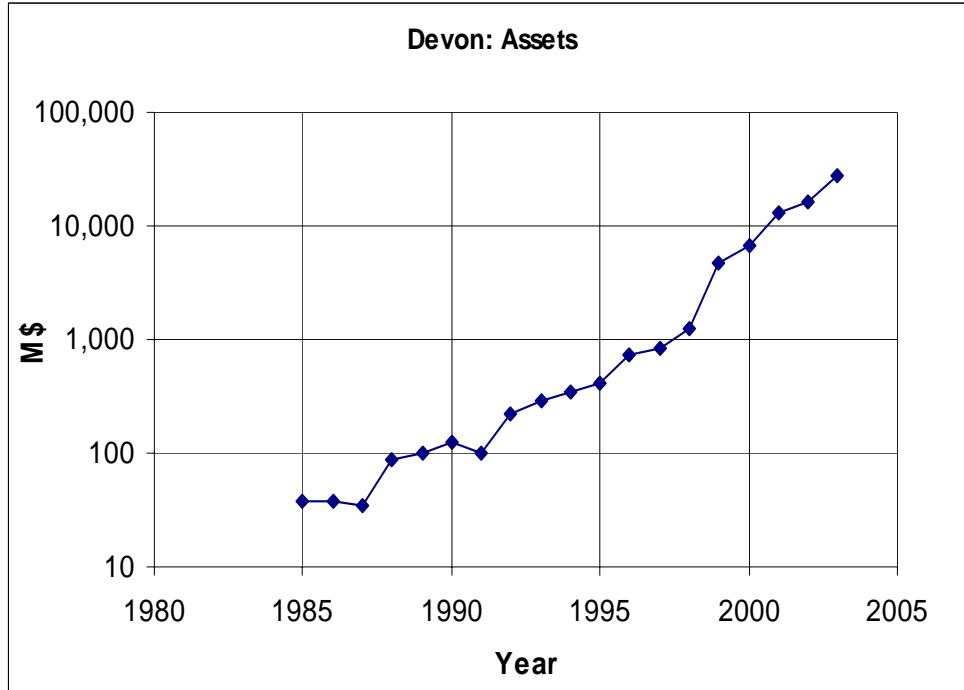


Fig D-1: Devon assets trend.

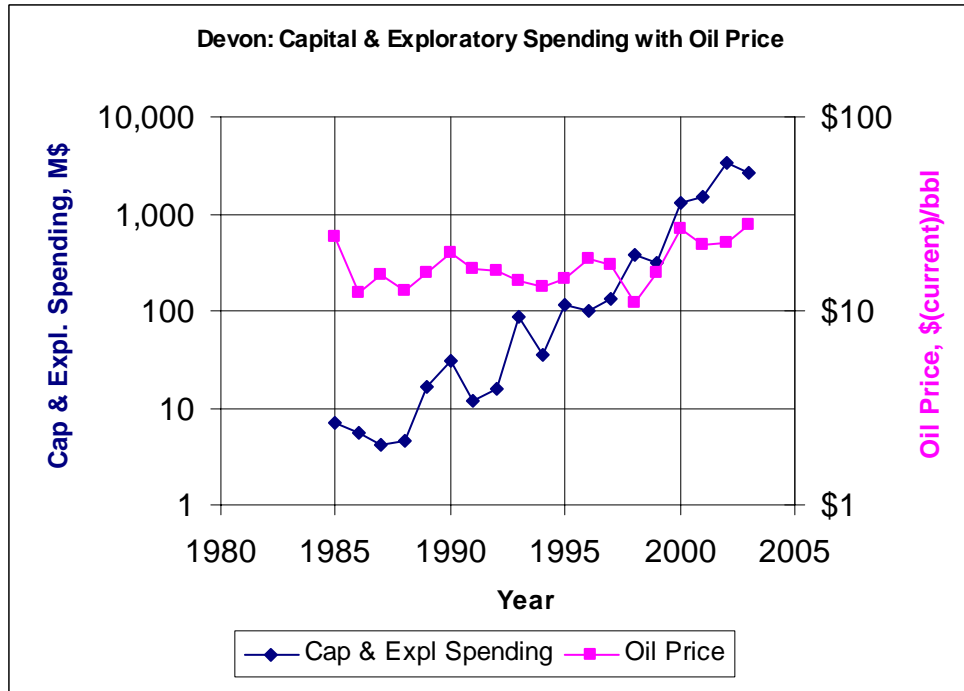


Fig D-2: Devon capital and exploratory spending with oil price.

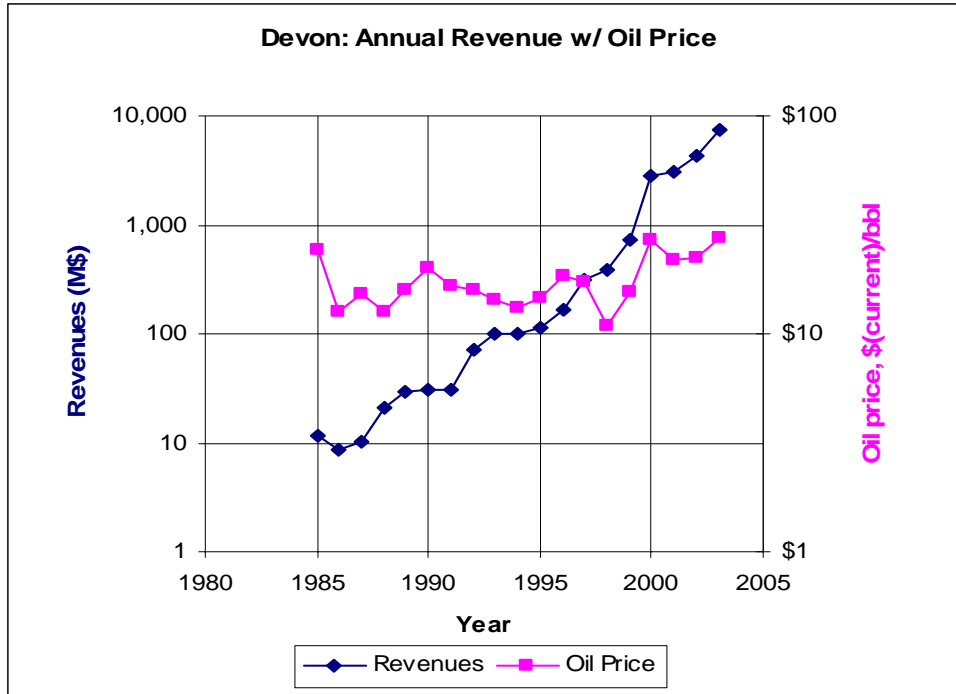


Fig D-3: Devon annual revenue w/ oil price.

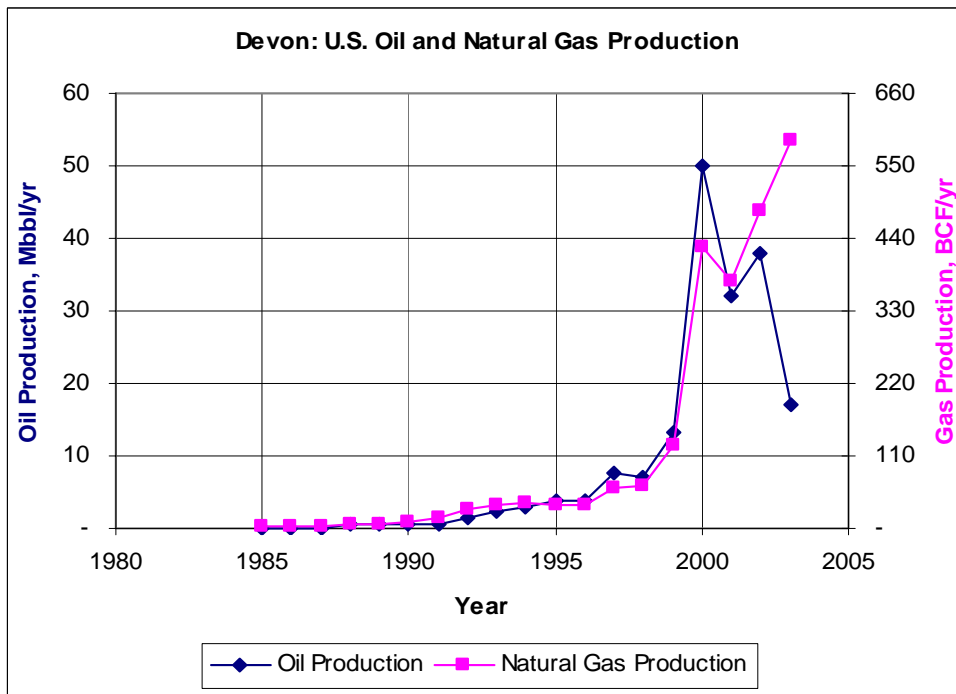


Fig D-4: Devon U.S. oil and natural gas production.

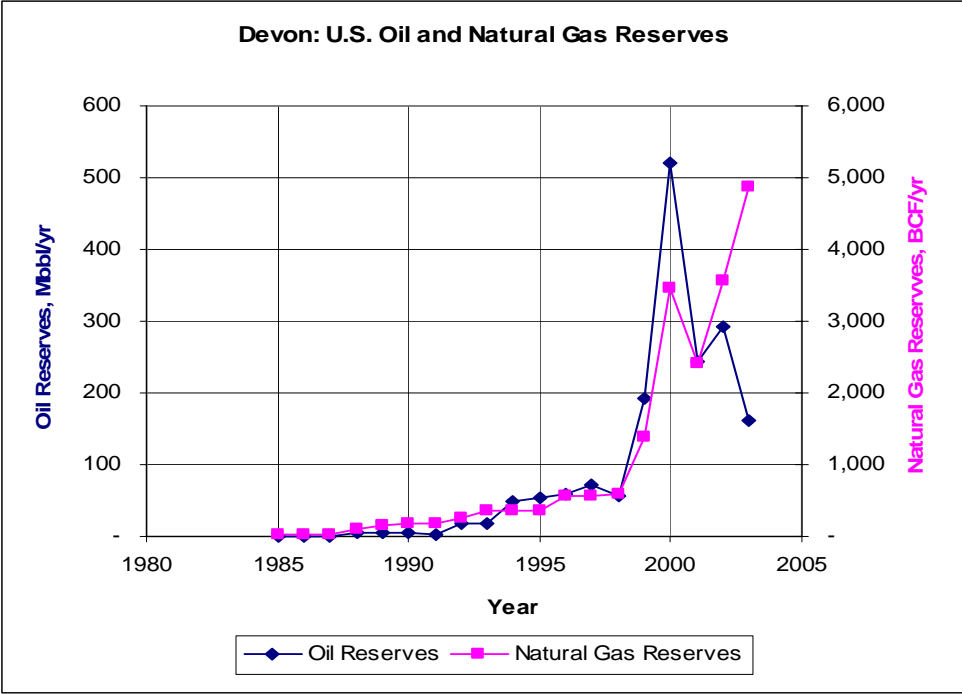


Fig D-5: Devon U.S. oil and natural gas reserves.

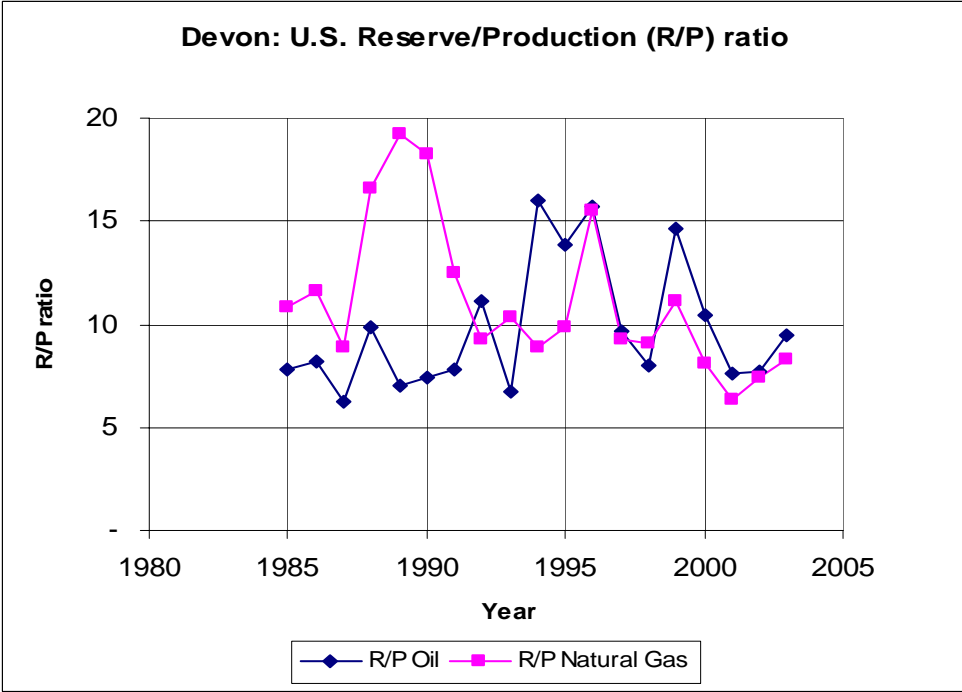


Fig D-6: Devon U.S. R/P ratio.

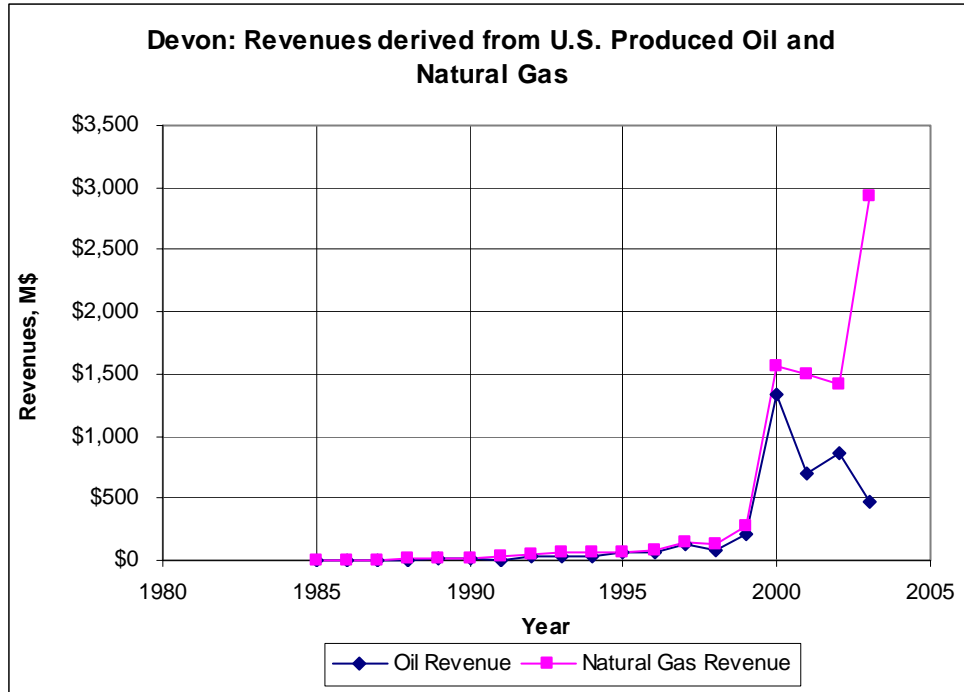


Fig D-7: Devon revenues from U.S. oil and natural gas production.

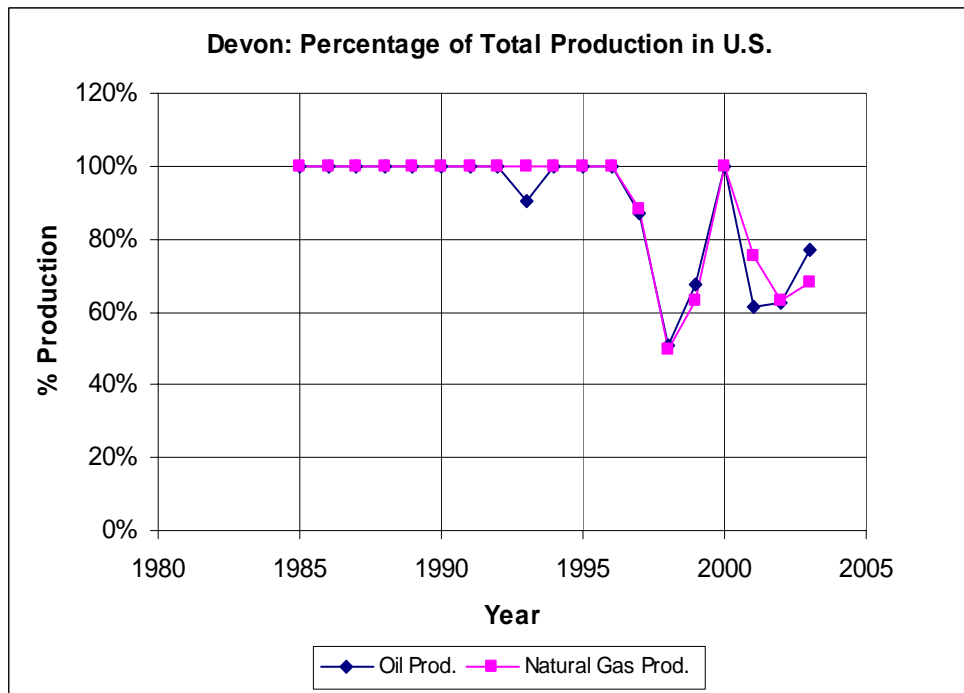


Fig D-8: Percentage of Devon production in the U.S.

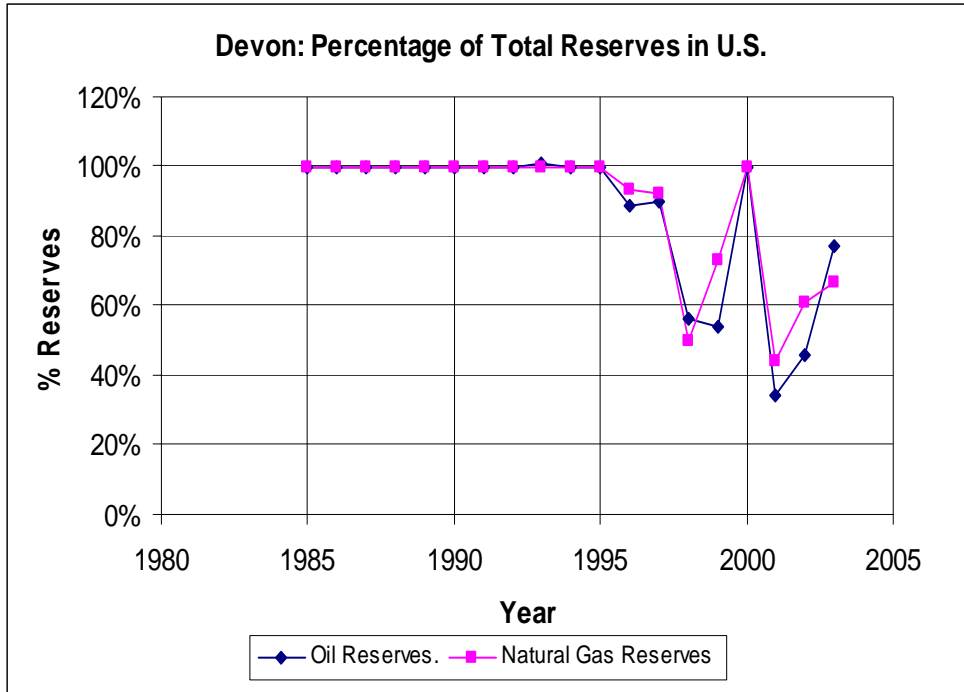


Fig D- 9: Percentage of Devon reserves in the U.S.

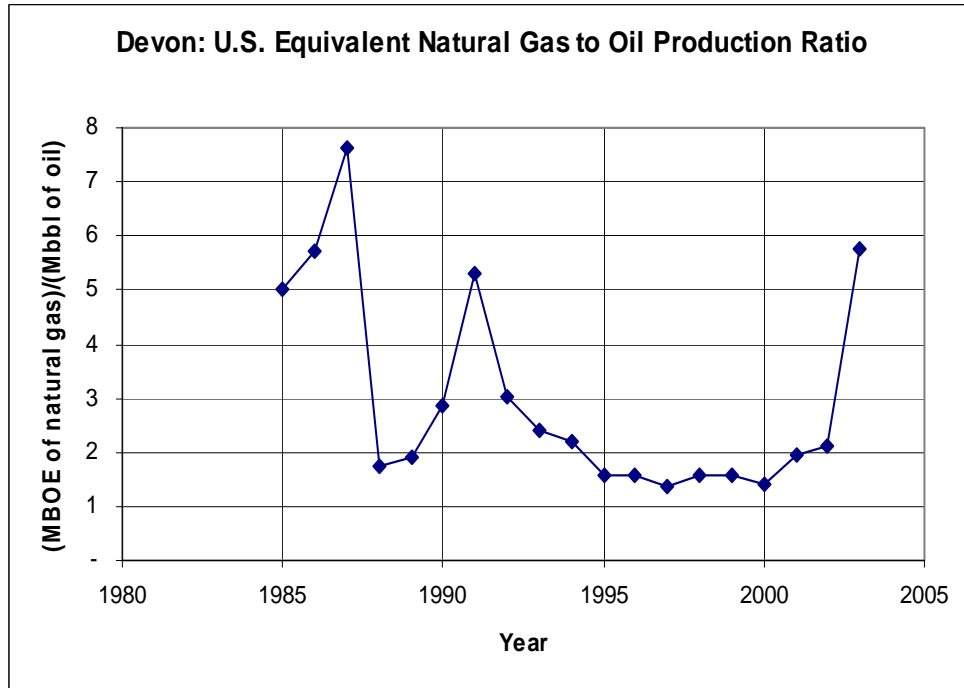


Fig D-10: Devon U.S. equivalent natural gas-oil production ratio.

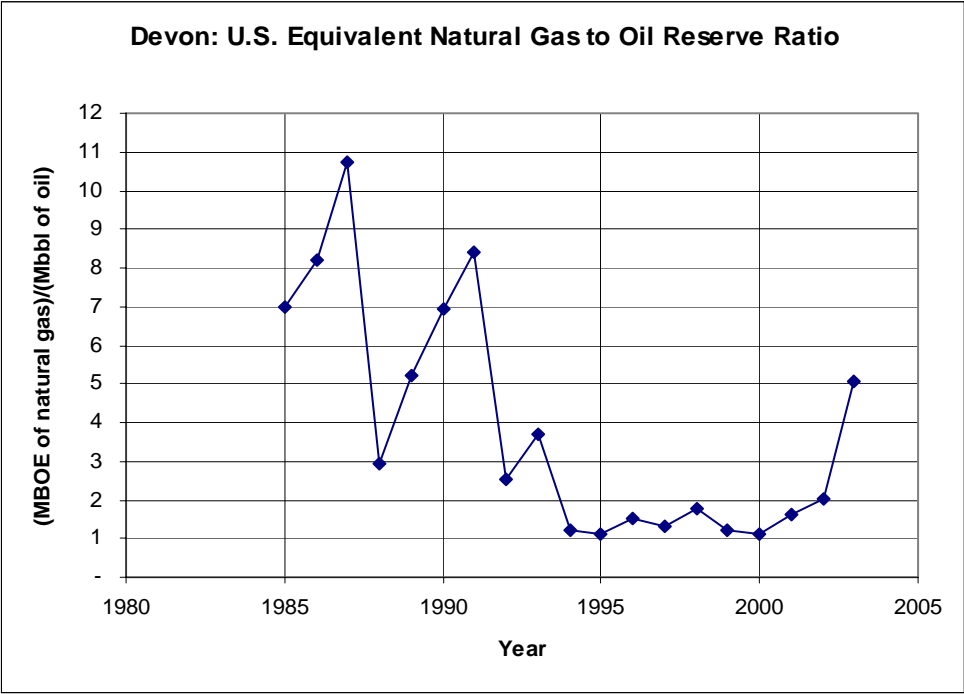


Fig D-11: Devon U.S. equivalent natural gas-oil reserve ratio.

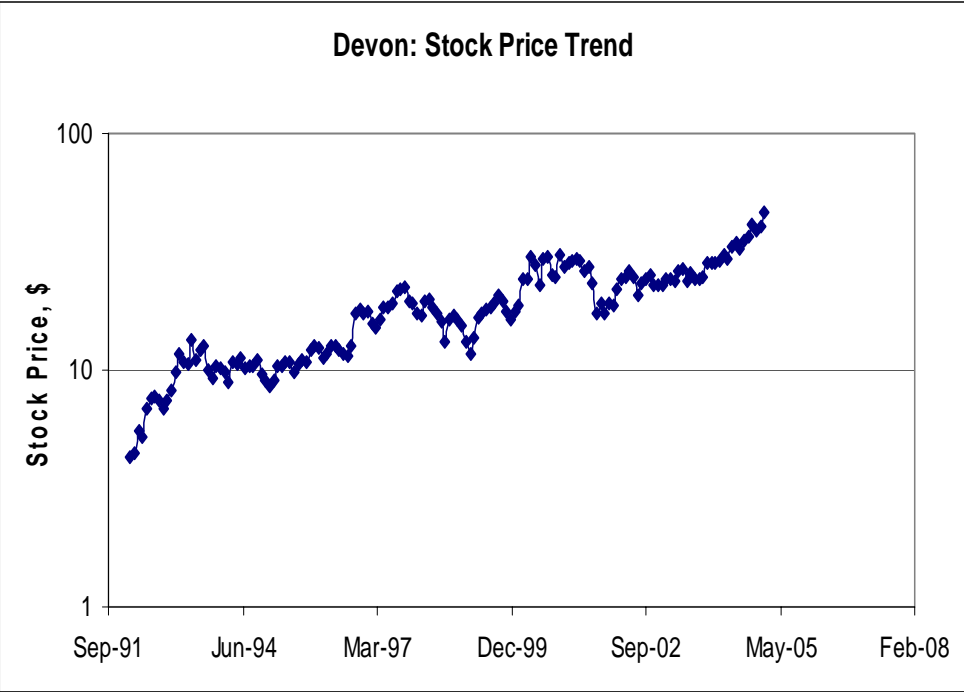


Fig D-12: Devon stock price trend.

Table D-1: Major Devon M&A Activities.

<b>Major Devon activities</b>	
<b>Year</b>	
1992	\$122M, Acquisition of Hondo Oil & Gas
1996	\$250M, Acquisition of Kerr -Mc Gee's NA (onshore oil & gas properties)
1998	\$750M, Acquisition of NorthStar Energy Corporation
1999	\$2.6B, Acquisition of Pennz Energy Company (significant GOM)
2000	\$3.5B, Merger with Santa Fe Snyder Corporation
2001	\$4.6B, Acquisition of Anderson Exploration Ltd
2002	\$3.5B, Acquisition of Mitchell Energy & Development
2003	\$5.3B, Merger with Ocean Energy

## 12. NOMENCLATURE

M\$	= million dollar
MCF/d	= thousand cubic feet per day
BCF/yr	= billion cubic feet per year
TCF	= trillion cubic feet
Bbbl/yr	= billion barrels per year
MMbbl/yr	= billion barrels per year
MBOE	= million barrel of oil equivalent
BTU	= British thermal unit
R/P	= reserve/ production

## Omobolanle Oke

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Tel: (832) 746-6580

ooke@neo.tamu.edu

### SUMMARY

A highly dedicated and motivated graduate student with good interpersonal skills. Seeking a challenging technical full-time position to apply my knowledge in the field of petroleum engineering.

### EDUCATION

#### Texas A&M University, Dwight Look College of Engineering

College Station, Texas

Master of Engineering in Petroleum Engineering, May 2005

- Recipient of Texaco Scholarship
- GPA: 3.84

#### Institute Français du Pétrole

Rueil Malmaison, France

Master of Science in Petroleum Economics and Management, July 2004

#### Tulane University, School of Engineering

New Orleans, Louisiana

Bachelor of Science in Chemical Engineering, Cum Laude May 2003

- Tulane School of Engineering Dean's List

### EXPERIENCE

#### Chevron Texaco

New Orleans, Louisiana

Petroleum Engineering Intern

Summer 2002

- Evaluated ST 176 CA-2 well for thru-tubing plugback workover
- Prepared rough procedure and obtained cost estimate from cased-hole group
- Estimated reserves and ran economics to justify the project
- Reviewed, evaluated and documented production histories for the ST 177C wells and reservoirs
- Estimated reserves and prepared redevelopment scenario with geologist

#### Chevron

Gulf of Mexico

Summer Roustabout

Summer 2001

- Gained a basic understanding of the day-to-day activities of offshore processes
- Performed operation tasks such as well testing, choke changing, and daily equipment maintenance
- Participated in environmental and safety precautions such as JSA, GATOR, and RCA
- Assisted in performing monthly compliance testing, NPDES inspection, and safety audits of platforms
- Assisted field electrician and mechanic in performing some of their daily duties such as calibrating gas detector systems, inspection, repair and installation of rotating equipment
- Familiarized with the different job functions of field employees

#### Century Exploration Company

Metairie, Louisiana

Career Externship Program

December 2000

- Developed knowledge of exploration and recovery of crude oil and natural gas
- Assisted a geologist and analyzed seismic data to locate pay zones
- Learned the procedures and economics of drilling

### ACTIVITIES

Society of Petroleum Engineers (Member)

National Society of Black Engineers (Membership Chair, Fundraising Chair, Student Council Representative)

Omega Chi Epsilon, Chemical Engineering Honor Society (Secretary)

Delta Xi Nu Multicultural Sorority (Publicity Chair, Fundraising Chair, National Board Representative)

Office of Multicultural Affairs (Program Coordinator, Multicultural Ambassador)

Community Action Council of Tulane University Students (SAT, ACT, and LEAP tutor)

### SKILLS

Computer: proficient in Windows 95, 98, NT

- Applications include Word, Excel, Access, PowerPoint
- Knowledgeable in software programming with C, PEEP, decision tree, WEM, CHEMCAD, HYSYS, Eclipse

Languages: fluent in English, Yoruba, semi-fluent in French