AN OVERVIEW OF PRODUCING PROPERTY ACQUISITION

T. Scott Hickman and Charles R. Vanorsdale
T. Scott Hickman & Associates, Inc.

Introduction

A basic decision faced by all oil field investors, since reserves are continually being depleted through production, is to either add reserves through drilling, enhancement and/or acquisition, or go out of business. The data available on finding costs indicate that it has usually been cheaper to buy rather than drill for reserves in recent years. This comparison may be distorted since the true finding cost is not known until the discovery is fully developed, which usually takes years. However, it is obvious from the data that the current decision is normally to buy, not drill. Hence, the drastic drop in rig count continues, while the number of acquisition transactions continues to be strong.

Brief History

Soon after Colonel Drake brought in the first commercial oil well, trading in producing properties began. Those who have read or seen Daniel Yergin's "The Prize" are aware that the early history of the industry is one of aggressive consolidations and forced mergers to gain control over markets. The historical antitrust action early in the twentieth century that broke apart the Standard Oil monopoly put an end to the predatory acquisition practices. The emerging major oil companies grew primarily through exploration and development, although some mergers and buyouts continued. In the last couple of decades before the start of the oil boom in the mid 1970's, the acquisition of producing properties had settled into a fairly predictable routine. Major companies had a limited staff of people looking for acquisition opportunities which normally involved blue-chip properties only. Major companies would occasionally sell off properties judged to be non-essential to operations. Independent producers were on the lookout for acquisitions, usually on a local level, that would compliment their existing operations. Overall, acquiring producing properties was a low-key activity compared to exploration and development. This began to change somewhat in the late 1960's when the limited partnership concept that had been successful with drilling ventures was applied to acquisition of properties through "income funds." This gave small, unsophisticated investors a chance to be in the oil business.

The energy boom created a tremendous demand for producing properties, not only among historical energy investors but all aspects of society. In fact, the prospects of ever-increasing oil and gas prices and a perceived energy shortage created a "feeding frenzy." Manufacturers rushed to secure fuel and feed stock supplies. Utilities fought to get future gas supplies committed. Producers, large and small, were scrambling to not get left out of the action and the ordinary investor was seeking the pot of gold at the end of the rainbow.

It literally became a situation of dollars chasing deals, where the buyer with the most optimistic pricing scenario became the high bidder. Not surprisingly few of these acquisitions proved profitable in the long run. The excesses of the boom led to the bust and the rest is history. The FDIC became one of the nation's largest independent producers as hundreds of producers went into bankruptcy and the weaker major companies became merger targets. Companies such as Petro-Lewis that had acquired thousands of properties were forced to liquidate.

Notwithstanding the excesses of the boom, acquisitions increasingly became the method of choice for adding reserves as exploration opportunities decreased and finding costs increased (Figure 1). Acquisitions moved out of the back room to become a major activity for nearly all producers, large and small (Figure 2). This has sparked an increased interest in various aspects of acquisitions from locating prospective properties to evaluating the production and negotiating a deal.

Market Dynamics

Throughout the boom/bust cycle of the last 15 years there has been a continuing demand for producing properties which has resulted in good properties commanding a premium price. This demand continues unabated today in spite of flat or declining oil prices. The current sources of properties are the majors that are down-sizing and companies forced to unload earlier acquisitions. The depressed oil and gas prices result in an emphasis on acquiring properties with upside potential. However, increasingly sophisticated sellers are learning to extract full value for this potential.

The implementation of each company's or investor's strategy creates the buyers and sellers necessary for a market in producing interests. The marketing vehicles that facilitate the actual trades include bid packages, auctions, brokers, advertisement, listing services, mergers and unsolicited offers. The driving force behind the oil and gas reserve market is the same as in any market. The buyer is after a profit whether it be short term or the buying of long term life reserves to supply refineries after the year 2000. The seller is hoping to either turn a profit on a previous investment or minimize losses.

While there are many aspects to a company's or investor's decision to buy or sell reserves, a particular strategy is formulated within the framework of a prevailing perception of future oil and gas prices. In fact, the pricing scenario will largely determine a buyer's chance of success. At any given point in time, there is a wide range of price forecasts being utilized, but the events that lead to a major shift in pricing perceptions are commonly shared experiences. Therefore, significant changes in oil and gas price forecasts tend to occur within the same general time frame across the industry. Figures 3 and 4 are the results of the Society of Petroleum Evaluation Engineers (SPEE) annual survey of price forecasts since 1982. Truly, a picture is worth a thousand words. Every major event in the industry over this time period is reflected in this series of pricing perceptions[1]. As long as the buyers and sellers are holding to a particular pricing perception, no matter how widely varied, the market should move toward some rough equilibrium as the various strategies are implemented. In fact, the differential in price forecasts helps drive the market. As the market approaches this equilibrium, activity should slow until there is another major change in price perceptions. These major shifts in perceptions energize the market by bringing in new players or changing the strategies of existing ones.

There are distortions that occur in the market that interfere with the natural movement toward equilibrium. These are largely the result of governmental policies, or uneconomical decisions about buying or selling that cause mismatches in ownership. Some properties will change hands several times before the proper level of ownership is achieved. The largest distortion to date occurred following the erosion of oil prices from historical highs in 1981 that led to the failure of hundreds of highly leveraged firms and investors during 1982-85. The anticipated flood of properties for sale was delayed several years as the FDIC and energy lending institutions engaged in mainly futile work-out exercises.

Strategy

The one clear message that has emerged out of the collapse of oil prices in 1986 is the need for a viable strategy. Operating margins are too thin, environmental liability too great and regulatory burden too heavy to survive without a workable strategy. Successful strategies start with the recognition that all companies or investors have limited resources in terms or personnel, expertise and capital. How and where these resources are deployed is the key. Deployment is a function of company objectives and focus. In relation to acquisitions, the concept of "advantage ownership" is paramount. A particular property is worth more to one company than another, depending on location, size, operating conditions and upside potential. A marginal isolated lease may be of value only to an offset "mom and pop" operator, while a large lease with CO_2 potential belongs in the hands of a company with resources (expertise and capital) to exploit it. The majors are certainly taking the concept of "advantage ownership" to heart in defining their "core assets."

Strategy within the context of this paper means deliberate planning for the continuation and/or growth of a business in the future. A project is considered strategic if it has the potential to significantly impact the company's long-term objectives. Nowhere is this concept more applicable than the oil business, which deals with a finite, depleting resource. Either you are depleting or growing your reserve base. There is no status quo.

The strategy involved in acquiring reserves has to be qualified in terms of corporate structure, objectives, source of capital and cost of capital. An income fund buying production for thousands of small investors goes about it differently than a major oil company using its own cash flow or an independent using borrowed money. A producing company has different objectives than an integrated company with downstream operations in need of equity crude. An operator with "patient" capital has different opportunities than someone servicing a bank debt. Most operators, both majors and independents, are risk-oriented and often seek a return on projects that compensates for risk in their overall operations. In contrast, insurance companies are not risk-oriented and might well be satisfied with a lower rate of return and a longer payout for what they judge as a safe investment in long life established reserves.

Impact of Funding Sources

The source of funding often determines the successful bidder on an acquisition package. If a buyer does not have internal funds available, it is nearly impossible to compete for quality properties using conventional financing. Either foreign money, which is usually more patient and often has a tax advantage, or "delayed accountability" funding will win out. "Delayed accountability" funding first became a widespread phenomenon during the boom in relation to income funds. The sponsors of these funds were rewarded through commissions, management fees and up-front carried interest. This placed the emphasis on doing the deal as opposed to making a long-term economic acquisition. Not surprisingly, the income funds were nearly always the high bidders until their house of cards began to come tumbling down in the early 1980's.

The next round of "delayed accountability" funding began after the oil price crash in 1986 as the so-called institutional money (pension funds, endowments, insurance companies) began to enter what they perceived to be a bottom market. This entry was accompanied by numerous published interviews with the professional managers claiming that they knew exactly how to avoid the mistakes of the past. Indeed the results, in most cases, were much better than the income funds. But as some of the institutional-sponsored funds such as Graham Resources began to unravel, it was apparent that, once again, there were up front incentives for "doing a deal" not related to ultimate outcome. Institutional money is still a source of funding even though returns have generally been less than was initially expected. This continued funding is due in part to the drop in interest rates that has forced money managers to settle for lower yields on non-stock investments.

The last couple of years small cap public energy companies have found favor with investors in the stock market. Not surprising, the most successful bidders for large acquisitions recently have been companies with access to the public equity market. Does this represent another form of "delayed accountability" funding? Some observers think so. Most stock analysts are limited to looking at the effect of an acquisition on company debt and short term cash flow. Seldom, if ever, is a valid cash flow projection available to determine the long term economics. Hence, accountability is delayed to sometime in the future. Once again a situation may be created where there are rewards for doing deals in spite of the ultimate economic outcome.

The obvious lesson in this is that there is a tremendous difference between buying reserves and buying reserves economically. Each acquisition must stand on its own merits and make economic sense for a particular company. The fact that others are buying the same type reserves at a similar price is not justification. If you are buying with your own money, self preservation will make you cautious. If you are using conventional financing, the lending institutions will make you cautious. If you are getting paid to buy reserves with investor's money - watch out!

Reserve Evaluation

The first reserve evaluation apparently has been lost in history, but the first bank oil loan was reported in 1928. Petroleum engineering was in its infancy. Because of the lack of accurate technical data and the chaos that existed in marketing, early evaluations could hardly have been more than rough estimates. The introduction of conservation, prorationing and tax laws during the 1930's and 1940's gave a more reliable data base from which to estimate reserves. After the East Texas Field was prorated and the U.S. economy strengthened in the late 1930's, domestic demand began to exceed supply. Oil prices improved enough to allow expansion to be financed by cash flow. After World War II, supply overtook demand owing to large U.S. discoveries and some displacement of U.S. crude by gas and non-U.S. oil. As a result, producing rates, particularly in Texas, were further limited by prorationing, making it harder to finance operations out of reduced cash flow. Bank borrowing became necessary, which increased the demand for reserve evaluations.

Postwar technical advances greatly improved the accuracy of reserve projections. Industry-accepted reserve evaluation methods began to emerge and reserve definitions were established. Evaluating reserves became a fairly routine engineering procedure where the only ecopolitical considerations were the allowable and the number of producing days in Texas. Pricing was constant and reserve projections were based on top allowable or exponential declines. Reservoir engineering and petroleum geology continued to mature as disciplines. Data gathering tools for logging, coring and testing became more accurate and comprehensive. The evaluator needed increased expertise as secondary recovery became widespread and offshore drilling introduced new concepts in the 1960s.

When oil prices increased in 1973, engineers were faced with the need to forecast economic parameters in order to cash flow the reserve projections. Close on the heels of escalating energy prices was political reality in the form of oil price controls, the 1978 Natural Gas Policy Act, and the U.S. government's ultimate solution to the energy crisis - the Windfall Profit Tax. These political constraints combined with increasing optimism about oil and gas prices began to relegate engineering to a secondary role. Engineers were devoting an ever-increasing portion of their time to playing lawyer and economist.

Recently the evaluator's role has become somewhat easier. With the demise of the Windfall Profit Tax and gas deregulation, most regulatory constraints are gone. Some degree of order has returned to the gas market as disputes between producers and purchasers have been negotiated, arbitrated or litigated. A more philosophical

approach to oil price forecasting has developed that largely ignores daily market volatility. Once again, the technical aspects of evaluating reserves are the major emphasis. The effects of ecopolitical assumptions are increasingly being evaluated through sensitivity analysis. More detailed discussions of reserve evaluation are contained in references 2, 3 and 4.

Reserve Determination Methods

The definition of oil and gas reserves approved by the SPE and SPEE in 1987 begin with the statement that reserves are estimated volumes. As stated in the SPEE guidelines for applying reserve definitions[5], "The word 'estimated' recognizes the reality of attempting to quantify the amount of hydrocarbons recoverable from reservoirs beneath the earth's surface, where available data represent only a minute sampling, and the recovery process takes place under ever-changing physical and economic conditions. In spite of these limitations, reserve determinations performed by properly trained and experienced professionals, acting independently and adhering to acceptable Reserve Definitions, have proven useful and necessary for the petroleum industry's requirement."

Standard techniques for the estimating of reserves fall into three broad categories: 1) analogy, 2) volumetric method or 3) performance analysis. Analogy is the application of past recovery of oil/or gas from analogous reservoirs to the reservoir under study. The volumetric method requires calculation of the reservoir volume and the anticipated recovery of the hydrocarbon in place. Under performance analysis, mathematical and/or graphical behavioral models are solved for oil and gas in place or projected for future recoveries.

In utilizing analogy, the reserve estimator should consider similarity of well spacing, geologic age, rock and fluid properties, depth, pressure, reservoir size, pay thickness, and reservoir drive mechanism. Adjustment of recovery can be done to reflect differences between the analogous reservoir and the reservoir under study. The analogy method should be applied as a check for reasonableness even when other methods have been utilized for estimating reserves.

The determination of reserves by the volumetric method involves three basic steps: 1) estimation of bulk rock volume of the reservoir, 2) estimation of rock and fluid properties and 3) determination of the portion of in-place hydrocarbon which is recoverable. Lack of data in any of the three areas will result in less reliable reserve estimates. Other factors which can influence reliability include geologic complexity and density of existing wells.

Common methods of performance analysis include: 1) material balance, 2) decline curve analysis, and 3) reservoir simulation models. Several methods may be applied in a single study to furnish independent methods of analysis of the same problem.

Material balance is a "conservation of matter" technique with the reservoir being treated as a "tank." A balance equation is solved through successive pressure decline (time) steps. The accuracy of the method depends on correct estimation of average rock and fluid properties, and especially on average reservoir pressure. Material balance is generally a more valid approach in high permeability reservoirs because of better pressure equalization.

Decline curve analysis of production rate versus time plots on single wells or multi-well leases is the most common method of reserve determination. Other production trend analysis techniques include water cut versus cumulative oil production, production rate versus cumulative production, and gas oil ratio versus cumulative production. The reserve estimator may be able to extrapolate other data, e.g., flowing tubing pressure, to estimate reserves. Analysis of production decline involves fitting an observed trend of declining production using one of several commonly accepted rate-time mathematical models, e.g., hyperbolic, harmonic or exponential. Use

of the "production/decline curve analysis" method has an advantage over the use of analogy/volumetric methods because the decline trend forecast also establishes a future production rate forecast.

The use of computers in decline curve analysis facilitates reserve estimations, but it does not replace the judgment necessary to evaluate the underlying causes for the behavior of the reservoir and well, such as normal capacity production decline, curtailments, rapid pressure declines, increasing water production, increasing back pressure on the well, changes in other operating conditions, sand production, etc.

Reservoir modeling can be considered to be a dimensionless material balance. Rather than the single tank, the simulator divides the reservoir into many adjoining "tanks" (cells). The resulting network of simultaneous equations for each "tank" requires computer solution. If sufficient data are available, simulation of a reservoir by computer modeling can be the most reliable predictor of future behavior.

Risk Considerations

Garb[6] divides reserve and producing property risk into technical, economic and political uncertainties. The technical category can be further divided into reserve uncertainty and producing risk. Producing risk, which includes the probability of mechanical failure and the capability of the operator to produce at the projected rates, is often neglected. The evaluator's traditional role, as shaped by time and cost constraints, normally excludes any in-depth audit of operations. Producing risk can be extended to include the financial ability of the operator and a consideration of the major working interest partners. Also, environmental liabilities are becoming increasingly more important.

All reserves estimates involve some degree of uncertainty, depending chiefly on the amount and reliability of geologic and engineering data available at the time of the estimate and the interpretation of these data. The relative degree of uncertainty may be conveyed by placing reserves in one of two classifications, either proved or unproved. Unproved reserves are less certain to be recovered than proved reserves and may be subclassified as probable or possible to denote progressively increasing uncertainty.

The market, by one means or another, considers risk in establishing value for producing properties. The evaluator normally uses a deterministic approach by assigning the most likely reserve volume and handles risk qualitatively through reserve categories. When determining the most likely volume, the evaluator often makes quantitative judgments about risk but may not recognize them as such. Quantitative risk considerations are properly added during the determination of market value.

The emphasis on strategy has led to increasingly sophisticated approaches to managing risk through diversification. Many companies seek a balance between oil and gas revenue so low prices for one product won't impact revenue from all properties. The use of the oil and gas future markets is becoming a common practice by majors and independents to establish a floor under prices. This approach is particularly relevant to acquisitions where repayment of a loan or investor is critical. Some experts feel that the growth in derivatives, swaps and other financial innovations is important to the oil and gas industry being able to meet its future capital needs. These instruments allow borrower and lender to finally come to terms with an age-old worry; that the price of the underlying commodity will change and not support repayment of the loan.

Market Value

Fair Market Value (FMV) has been defined as the price agreed to by a willing buyer and seller, neither being under compulsion to act and both having full knowledge of the relevant facts. As pertains to the sale of producing properties, this definition has been expanded to include adequate exposure to the market.

Undoubtedly, some mule trader started dealing in producing properties not long after Colonel Drake's discovery. Early buyers and sellers established rules of thumb to determine market value, such as price per daily barrel of production or a multiple of current monthly income. The historical basis for these is understandable in large fields such as East Texas with top allowable and constant pricing. Another approximation that evolved was one-third of the product price for reserves in the ground (which still works amazingly well in some instances). Most rules of thumb became outmoded with prorationing, loss of top allowable capacity and pricing uncertainty. Also, increased availability of technical reserve evaluations made other approaches possible.

Reserve and cash flow projections discounted for the time value of money currently serve as the basis of most FMV estimates. The approach usually involves risk-adjusting the discounted cash flow to achieve specific economic thresholds. Attempts at gaining an insight into industry's use of risk adjustments have not been very successful. In view of what is required of risk-adjustment factors, this is not surprising. Risk adjustments involve all the previously discussed uncertainties plus consideration of profit and sometimes income taxes.

The nearly universal use of discounted cash flow in establishing reserve value may not always be justified. Long-life reserves, in particular, are heavily penalized by discounting for the time value of money[7]. Alternate methods involving after-payout economics or amortization concepts give different answers.[8,9,10]

A commonly accepted procedure for estimating FMV is to risk-adjust discounted future net revenue and check the resulting economic indicators for reasonableness. These economic indicators include payout, rate of return and discounted return on investment. If some indicators fall out of the accepted range, the risk adjustment factors are changed. Ideally, a combination of risk adjustments and economic indicators can be derived that fits within reasonable ranges. If not, either the producing characteristic of the package or the economic scenario is abnormal and should be investigated further. The estimate derived in this manner is a hypothetical "investment" value which may or may not be a reasonable approximation of FMV. There obviously is no way the evaluator can anticipate and weigh all the factors that the seller and an unidentified future buyer might consider. Even an actual sale may not establish the FMV if it is not an "arms-length" transaction or if the package has not been adequately exposed to the market. The argument is well made that the occasionally abnormally high price paid by the "greater fool" does not meet the FMV test either.

In the above approach, the discounted cash flow, rather than the reserves, is risk-adjusted, making the economic indicators a moving target. An indicated payout of 4 years and a rate of return of 18% may be acceptable economics for a proved developed producing reserve purchase. Such a return probably would not be commensurate with the increased risk involved with proved undeveloped and certainly not probable reserves. This fact requires that FMV be estimated separately for each reserve category. The range of risk-adjustment factors usually applied to the discounted net revenue is shown on Table 1 for each reserve category.

Price sensitivity analysis has become popular in establishing market value. Computers allow any number of economic scenarios to be run quickly and cheaply. One common sensitivity check is to run a pessimistic price scenario to determine downside economics. Because operating costs are determined by physical conditions not related to price, the profit margin is a nonproportional function of product price. Many marginal properties purchased in recent years have had their profit margin eliminated by the low prices in late 1993. What appeared to be a bargain purchased at the bottom of the market can become a financial disaster with just a small price drop.

Proper sensitivity analysis can reveal this danger or, conversely, the potential for a several-fold increase in profits if prices rise slightly.

Due Diligence

Once a letter of intent with the seller is signed, a prospective buyer undertakes necessary due diligence to make sure that the premise under which the offer is made is true and to uncover any situations that could impact the value of the properties. The process is not unlike signing a contract on a house where you are given a certain period of time to have various inspections and inquiries made. Due diligence is hard work, but purchasers are imprudent if they do not undertake it. Technically, it involves confirming productivity, inspecting equipment, verifying operating costs, checking current operating conditions etc. Legally, it involves both verification of ownership and investigation of all contractual relationships, such as gas price contracts and operating agreements, plus any other potential liabilities.

Due diligence is a complex subject with serious ramifications[11]. Unfortunately due diligence is sometimes conducted as an afterthought by the buyer just before closing. Many acquisitions fail financially, not because the reserve projections were incorrect or pricing scenarios unreasonable, but because no serious considerations was given to future operating costs.

In recent years, the first thing that comes to mind when acquiring properties is environmental liability. This ranks right alongside future oil and gas prices as the number one concern of buyers. Environmental surveys are rapidly becoming a standard procedure for most acquisitions.[12,13]

Closing

In the immortal words of Yogi Berra, "it's not over until it's over." A few years ago an engineer, who had been involved in several billion dollars worth of acquisitions and divestitures, was a guest lecturer in a course I was teaching on property acquisition. His main emphasis was not on evaluation, but making sure that the buyer starts receiving oil and gas payments on the interests acquired. Things don't happen automatically upon reaching an agreement with the seller. A successful acquisition requires not only proper technical analysis, but preparation of the necessary legal documents that lead to a proper transfer of ownership. Remember that from a seller's standpoint the deal is not done until the money has been transferred into his bank account. For the buyer, the deal is not done until he begins to receive oil and gas payments for the interests purchased.

Offers to buy and sell properties are normally conveyed in writing, utilizing documents drawn up by lawyers. Once an offer to purchase has been tentatively accepted, the two parties enter into a Letter of Intent that sets forth; 1) interests being purchased at a certain price, 2) a timetable for conducting the due diligence, 3) detailed closing procedure, 4) method of payment, 5) any preferential rights and 6) approvals required. Normally a procedure is provided for curing any discrepancies in the interests so the deal doesn't fall apart if all the decimals do not add up. A successful closing is a result of a coordinated effort by experts with legal, administrative, accounting and technical backgrounds. The evaluation engineer is an important part of the team with the responsibility to provide reserves and cash flow projections that will allow a knowledgeable business decision to be made.

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Table 1
Risk Adjustment
To Discounted Future Net Revenue

Reserve Category	Risk-Adjustment Factor
PDP	0.70 to 0.80
PDSI	0.60 to 0.75
PDBP	0.50 to 0.65
PUD	0.40 to 0.60
PROB	0.20 to 0.50
POSS	0.00 to 0.25

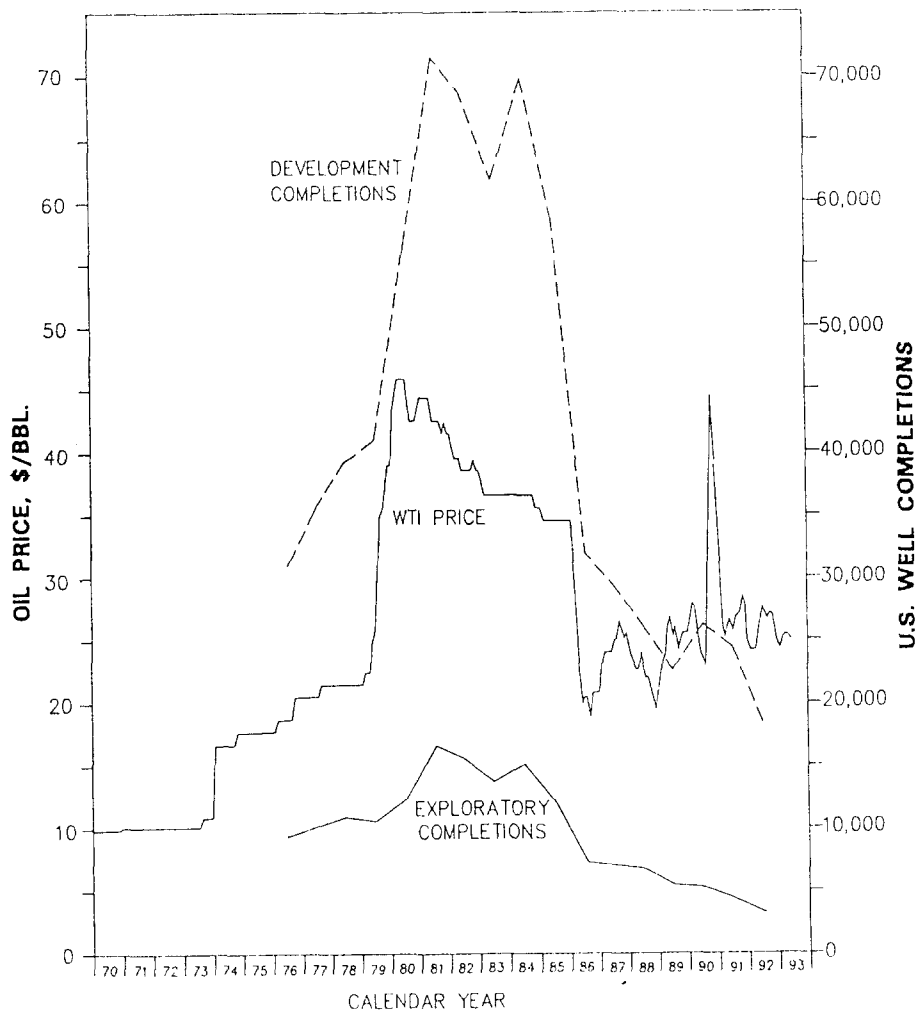

Figure 1

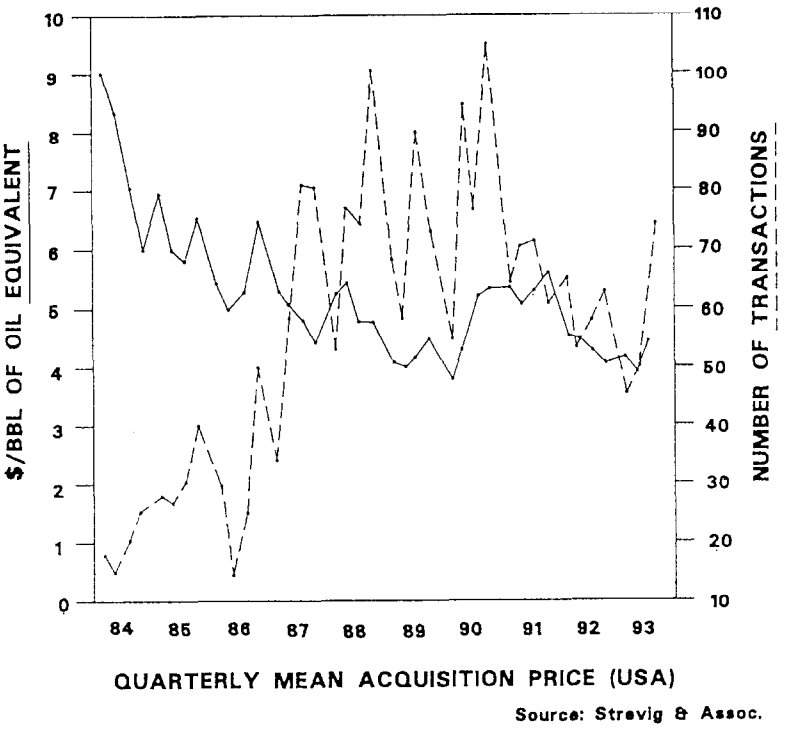

Figure 2 - Quarterly mean acquisition price (USA)

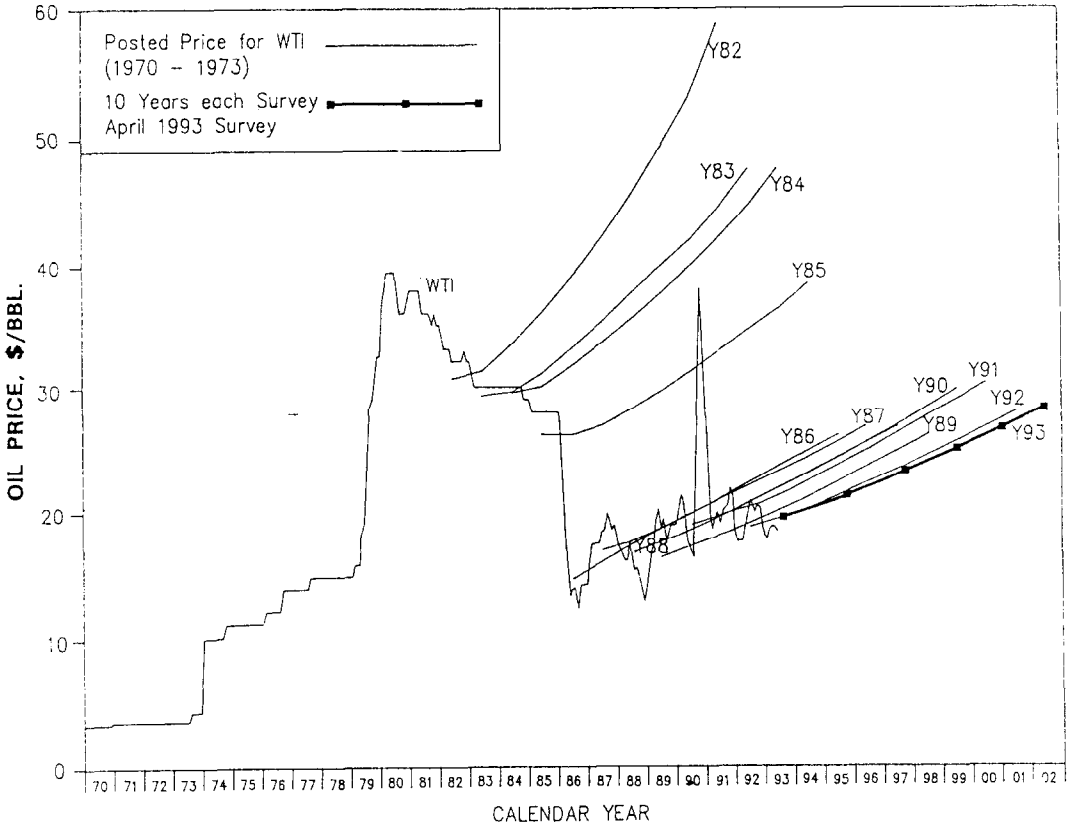

Figure 3 - Oil price forecast - SPEE 1993 survey

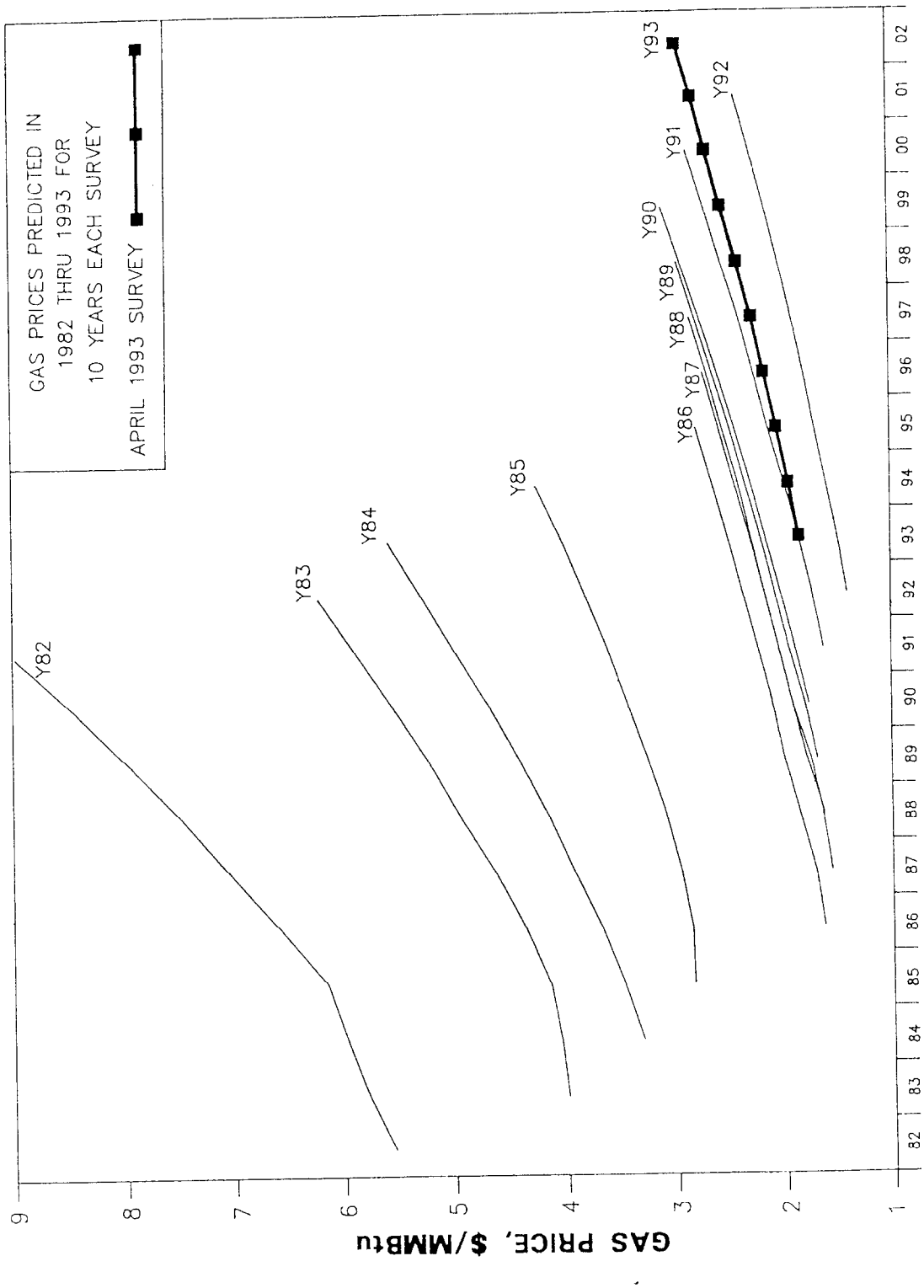

Figure 4 - Gas price forecast - SPEE 1993 survey