

# The Future of the Oil and Gas Industry: Past Approaches, New Challenges

by Harry J. Longwell  
Director and Executive Vice President  
Exxon Mobil Corporation

**A**s this article's ambitious title suggests, I plan to cover a lot of territory in this article. Predicting the future of our industry can be a dicey undertaking. There are simply too many interrelated variables to get a firm grip on the years ahead.

We would do well to remember the caution economists were given some time ago, that, "If you can't forecast accurately, then forecast often." That admonition is certainly relevant today in these turbulent times, and consequently, we do see frequent forecasts.

Strongly affecting our view of the future and our understanding of the present is the large number of complex factors influencing the current industry environment. But that is nothing new. History tells us that our environment has always been complex. That being so, there is a lot that history can teach us as we look ahead 10-20 years.

Some very significant factors, such as technology, economics and politics, have long played key and sometimes changing roles in our history. I'll illustrate that point shortly.

## Historical Trends

In order to see how trends have worked with and against each other in shaping the destiny of oil and gas, we must look closely at several key factors. The historical charts contained in this article, which were developed by our exploration company, are designed to illustrate some of the more important relationships.

We'll start by first examining the single most important element of our business, or, for that matter, any business. It's also the reason I'm so optimistic about our future. That element is the demand for what we produce and sell.



As Figure 1 indicates, demand is expected to rise through the year 2010 at a rate of about 2 percent per year for oil and 3 percent per year for gas. This projection reflects the significant benefits of hydrocarbon energy – namely, its comparatively low cost, its ease of use and its flexibility to enhance our lives in multiple applications.

Perhaps most important, however, is the fact that oil and gas consumption is essential to sustaining economic growth in the industrialized world and is key to progress in nations working their way toward prosperity. This is true even with an outlook that assumes significant energy efficiency improvement. Without that improvement, the demand growth might be even greater. I should also note that much of this projected growth is expected to occur in the developing countries that still have very low levels of energy use per capita.

The catch is that while demand increases, existing production declines. To put a number on it, we expect that by 2010 about half the daily volume needed to meet projected demand is not on production today – and that's the challenge facing producers.

This means industry may need to add some 80 million oil-equivalent barrels per day to production by 2010 to meet projected demand. The cost of doing so could reach \$1 trillion, or about \$100 billion a year. That's substantially more than industry is spending today.

A closer look at how our industry has met society's energy needs in the past will put some perspective on this (Figure 2). The growth in oil demand remained flat through the first five decades of the last century, then took off after World War II and continued to rise as it fueled unprecedented economic growth. There was a temporary stall at the time of the second oil crisis, but

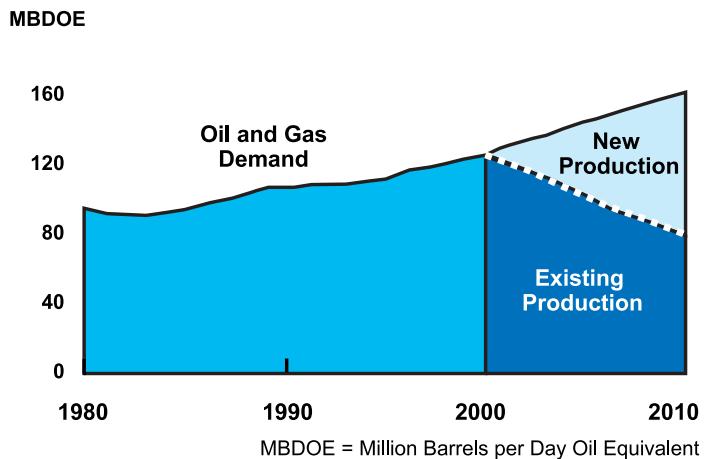


Figure 1: Oil and Gas Demand

demand resumed its growth by the mid-1980s.

We learn some very important information by comparing the 100-year demand curve with the volumes of oil discovered during the same period of time (Figure 3). The greatest exploration success occurred prior to the creation of OPEC, driven by large discoveries in the Middle East, Russia and on the North Slope of Alaska.

Obviously, technological advances in exploration have been matched by technology advances in development. Both have been key factors in raising production volumes. In recent decades, new discoveries in Africa and parts of the former Soviet Union, coupled with the ongoing increases from OPEC and vigorous exploration and production in other parts of the world, have led to increased supplies. Nonetheless, as Figure 3 indicates, resource additions have lagged behind demand since the early 1980s. However, the area under the discovery curve over the entire time period since 1900 is still over twice that under the demand curve.

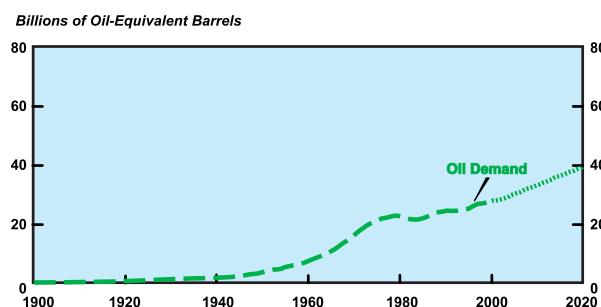


Figure 2: 100-Year Oil Demand

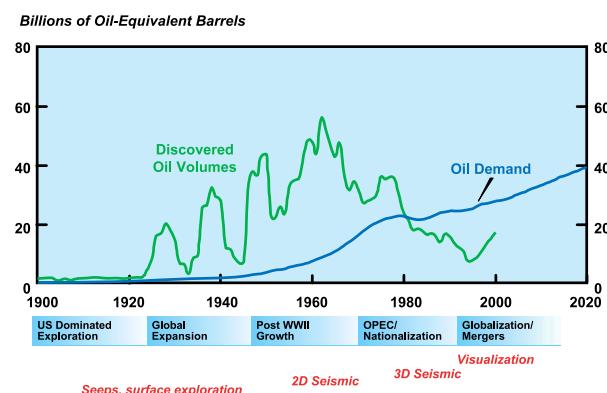


Figure 3: Oil Supply and Demand

We see a similar story in natural gas. Gas demand, which is rising at a slightly faster rate than oil, is currently being driven by rapid growth as a fuel for clean and efficient electric power generation (Figure 4). As with oil, gas resource additions have exceeded demand for most of the last century (Figure 5). Much of this supply was discovered between roughly 1960 to about 1980. This was driven by major discoveries in Russia, the Middle East, the Netherlands and Indonesia.

The slight increase in resource additions in recent years reflects access to areas previously off-limits to industry, and technology advances that enable us to make drilling economically feasible in more challenging operating environments.

One other factor must be included in the supply and demand history of oil and gas over the last century, and that's price. In plotting discoveries against constant dollars, an interesting phenomenon appears: Most of our discoveries were made in a much lower price environment than today, and cycles of discovery show little correlation with price over the long term (Figure 6). In recent times, however, the connection has grown closer.

What this tells us is that, contrary to some widely held beliefs, discovered volumes, over a long period of time, have not been closely related to price fluctuations. They have been driven more by the evolution of technology and geopolitical developments that improve access. This isn't to say that price doesn't matter, but technology and geopolitics will likely be the most important factors in our future as well.

These realities also define the business challenge we face as an industry. In the recent past, we have seen increasing demand for oil and gas, but generally decreasing discovery volumes, during a period of fluctuating but generally higher average prices. In spite of conventional wisdom and dire economic predictions, our industry has been successful in this environment. We have a business model that combines technology, political relationships, experienced personnel, environmental protection and economics (based on lowest possible unit cost) in the high-risk pursuit of a vital but finite commodity.

### The Future Role of Petroleum

Success in the future of oil and gas will require the continued adaptation of a complex business model to unforeseen challenges. One safe bet is

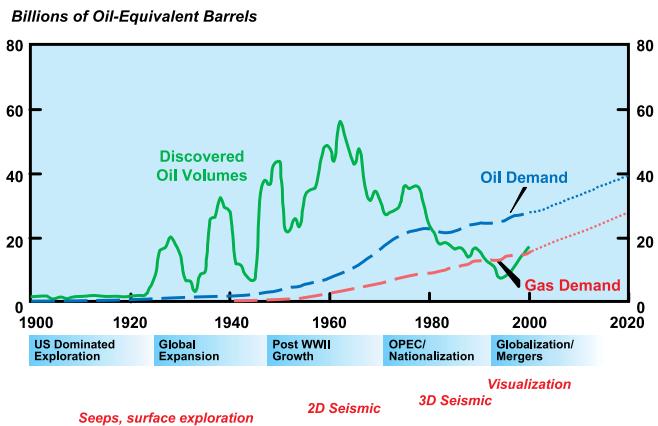


Figure 4: 100-Year Gas Demand

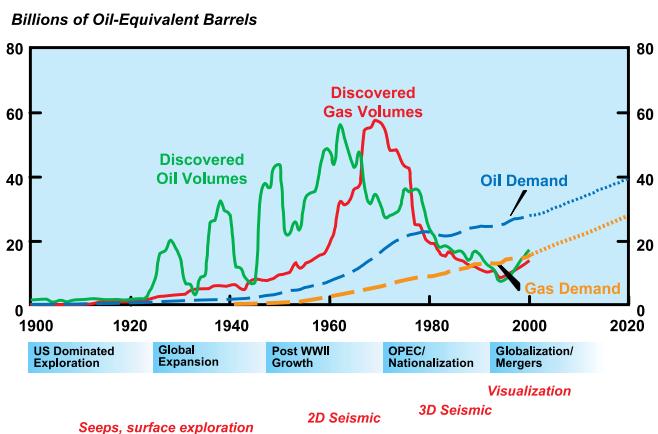


Figure 5: Gas Supply and Demand

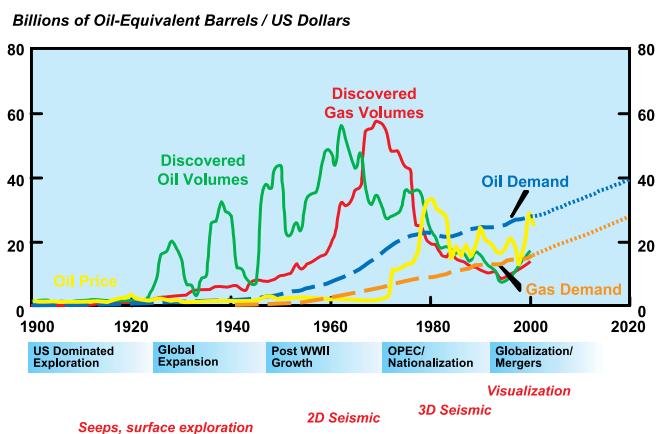


Figure 6: 100-Year Oil Price

that demand for oil and gas will continue to increase, as they are expected to remain the leading energy sources for some time to come. We also hope to see a continued increase in exploration success and production as additional areas are opened for exploration and as our technologies evolve.

Price is a question mark, as usual. Figure 7 shows a range of third-party price predictions from 2002 to 2020. Depending upon whom you choose to believe, price could grow substantially or not at all. Take your pick. There is no way to predict it or control it. Whatever the case, we must push ahead to keep production costs low, while developing new technology that we can control.

Another trend is much clearer than price. It's getting harder and harder to find oil and gas. Industry has made significant new discoveries in the last few years. But they are increasingly being made at greater depths on land, in deeper water at sea, and at more substantial distances from consuming markets.

Maintaining this record of exploration success will require the development of new and better technology. A key example, and one of today's more exciting prospects, is technology that directly detects and distinguishes the presence of hydrocarbons.

### Major Challenges

Let's begin to wrap this up with a summary of the major challenge facing the industry. That challenge is to ensure that both new and discovered resources can be produced in an economically and environmentally sound manner to meet increasing demand and offset natural field decline. We've already shown this can be done, but the pressure to maintain that performance will only intensify because the absolute requirements are higher.

Environmental fears have already led to restrictions to explore in places such as Alaska and other parts of the world. Concerns over potential climate change have led to demands for greater control of energy use and could well impede our ability to produce adequate amounts of energy.

Further, new supplies are located at increasing distances from consuming markets. That's especially true for gas. Finding economic ways to solve this problem is part of the challenge – and an area of great competition within our industry, which, of course, the public benefits from. So how do we meet this challenge?

We will increasingly rely on technological advances. I've always found it noteworthy – and disappointing – that ours is seen as an old-economy, low-tech industry. Everyone in the industry knows better. We are one of the highest-tech industries in the world. The Offshore Technology Conference has long been a testament to that. My company and others maintain vigorous programs of research and development to expand the capabilities and lower the costs of our operations.

Another major element in our success will be making the most of corporate resources to lower costs and increase operational efficiency. Most recently, this has taken the form of mergers. Exxon and Mobil did not merge to become bigger. We merged to become better. We wanted a broader portfolio of exploration and production prospects, optimization of our downstream assets, synergies in our research and increased competitiveness through reduced costs. The importance of reducing cost will remain.

In recent times, we have seen a trend of opening or re-opening large areas for international exploration and production. These openings have come about because we

have developed partnerships with governments so that energy development can provide mutual benefits. In addition, we have usually been able to work out reasonable tax and fiscal regimes that recognize the long lead times and risks involved in what we do.

Maintaining these partnerships will be key to our success in the future as it has been in the past.

Among other factors that could affect energy supplies is political instability in key energy-producing regions. We have already seen this following the historic changes in the former Soviet Union. And we all recognize the potential fragility of supplies from the conflict-torn Middle East.

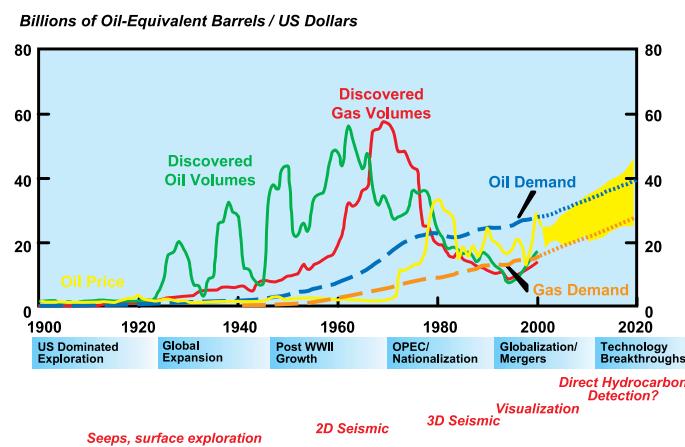


Figure 7: Projections Through 2020

In closing, let me say that I believe industry has the resources to meet future global energy demand for some considerable time. I base this in part on my belief that technological advances will continue in exploration, development and production, just as they have in the past. This is the one major component in our success equation that we can control, and we must be relentless in its pursuit.

## **Responding to change has been and will continue to be the great strength of our industry and the source of excellent opportunities for our people, who make it all happen.**

Such advances will be critical to meeting energy demand after 2010. I think it is well within the realm of possibility that many of our future discoveries will come not just from new frontier areas, but also from proven areas, as evolving technology improves our ability to virtually "see" and distinguish the oil and gas before we drill.

### **Reasons for Optimism**

I believe we can be optimistic as well about maintaining constructive relationships among producing countries, consuming nations and energy companies. Periodic disagreements may arise, but one very positive factor is that all involved have an interest in ensuring the adequate production of energy. This cooperation has been tested and proven throughout our history.

To be sure, this factor is not as controllable as technology, but we have established an excellent record, thanks to the mutual benefits energy development creates and the fact that we make good things happen in developing nations.

In other words, in my view, none of the potential challenges we face is likely to become so serious as to threaten world supplies over an extended period. My confidence in this opinion is based largely on the success we in the industry have had, over many decades, in rising to the occasion and finding a way to solve problems.

We have continued to establish new arrangements with governments, construct new organizational structures and develop new technologies to meet the challenges we have periodically faced. Responding to change has been and will continue to be the great strength of our industry and the source of excellent opportunities for our people, who make it all happen. ■

**Harry J. Longwell is executive vice president of Exxon Mobil Corporation.**

Prior to the merger of Exxon and Mobil, Mr. Longwell was senior vice president, member of the Management Committee and director of Exxon Corporation. His primary responsibilities included the corporation's oil, gas, coal and minerals exploration and production activities.

After graduating from Louisiana State University in 1963 with a petroleum engineering degree, Mr. Longwell began his career with Exxon as a drilling engineer in Exxon Company, USA's production office in New Orleans. After a number of engineering and supervisory assignments in Louisiana, California and Texas, Mr. Longwell was named operations manager in Corpus Christi in 1974. Later that year, he moved to Exxon USA's Western Production Division in Los Angeles as operations manager with responsibility for Exxon's producing interests in Alaska, and in 1977 he became division manager.

Mr. Longwell served as operations manager in the Production Department of Exxon USA in Houston from 1980 to 1983, when he was named vice president for the department with responsibility for the company's U.S. production activities.

In 1986 he moved to London as vice president of Exploration and Production in Europe. He returned to the U.S. later that year as executive assistant to the chairman and the president of Exxon Corporation in New York. Mr. Longwell became vice president of Exploration and Production for Exxon Company, International in Florham Park, New Jersey, in 1987, then senior vice president in 1988 and executive vice president in 1990. He was named president of Exxon Company, USA in 1992. He was elected a senior vice president of the corporation effective January 1, 1995, and was later elected a director in October 1995. He was named executive vice president of the corporation in 2001.

Mr. Longwell is a member of the Executive Committee of the Board of Directors of the National Action Council for Minorities in Engineering and is on the Board of Visitors of the University of Texas M.D. Anderson Cancer Center. He also is a member of the Board of the University of Dallas and the Advisory Board of the Dallas Area Habitat for Humanity. Mr. Longwell is a long-standing member of the American Petroleum Institute and the Society of Petroleum Engineers.