The Role of Energy in the 21st Century

by Rex W. Tillerson
President, Exxon Mobil Corporation

Growing markets, new technologies, and geopolitical events are transforming the oil and gas business and reshaping the energy landscape. The challenge of supplying energy to the world's economies today and in the future is immense, but there is good reason to be confident about our ability to continue to meet this critical objective.

The evolving changes that are under way in how industry finds and develops new energy supplies are creating a new reality for all of us – a reality that presents significant challenges, and places a premium on sound management systems and decision-making.

The petroleum industry has demonstrated it is a master of change throughout our history. Collectively, companies in our industry have gone from producing less than 3 billion barrels of oil equivalent energy in 1930 to supplying nearly 50 billion barrels annually today.

The contributions that we and our predecessors in this industry have made to peoples the world over are even more remarkable when you consider the astonishing benefits this ample, reliable energy supply has brought to societies through greater economic prosperity, improved standards of living, unprecedented mobility, and a kaleidoscope of petroleum and petrochemical products.

The challenge we face, as have our predecessors, is sustaining this record of success in the future. We all know that providing affordable and reliable energy supplies is vital to the progress, prosperity, and well being of the world's citizens.

In the coming decades, meeting the expected increase in global energy demand will require a broad portfolio of energy options. At the same time, hydrocarbon fuels – and more particularly oil and gas – are likely to remain the primary energy source through the middle of the century.

It is absolutely vital that we pursue policies and actions that reflect the facts and realities of national and international energy markets. To ensure that we have enough energy in the coming years, we need to avoid wishful think-

ing. We need to face the energy future realistically and be committed to steps that will address energy issues in practical ways. It is important for each of us to consider the consequences if we fail to meet the world's need for safe, affordable, and reliable energy.

The petroleum industry is a long-term business. The new supply of petroleum the world utilizes today is available because of decisions and risks undertaken by our industry 5, 10, and even 15 years ago. Similarly, the decisions we make today related to exploration, development, production, transportation, refining, and distribution will likely affect results for many, many years – even decades into the future.

We devote substantial resources and effort to recognizing, analyzing, and understanding these long-term dynamics. Though we never claim an ability to predict the future, we are always working to identify and analyze the trends and issues most likely to affect the long-term world energy environment. Through this effort, we develop a planning framework based on what we see as the outlook for energy.

Each year, we update our outlook for future energy demand and supply. We measure our views against those of others, including the International Energy Agency and the U.S. Department of Energy. There is a well-established relationship between energy demand growth and economic growth. You cannot have economic growth without reliable, affordable energy supplies.

Among other things, we look at global population trends, as the number of energy uses is obviously important in determining how much energy we will need. A quarter century from now, the world's population is expected to be about 8 billion people – 30 percent higher than today. Ninety-five percent of the increase will occur in developing countries.

Developing countries are also expected to

grow their economies about two times faster than industrialized countries. Some 85 percent of the world's population lives in developing countries, where GDP per capita is only 6 percent of that in the developed world.

Some 1.6 billion people have no access to electricity, 18 percent lacks access to safe drinking water and 2.8 billion are without proper sanitation. This presents all of us in the global community with opportunities and responsibilities. While the developing world represents a little more than a quarter of the world GDP today, by 2020 its share will rise to more than a third.

We believe global economic growth will continue at just under 3 percent per year, or roughly the same pace as the past 20 years. We expect global demand for all forms of energy to grow at about 1.7 percent per year on average, rising more than 50 percent from about 220 million oil-equivalent barrels per day currently to 335 million oil-equivalent barrels daily by 2030. That is a huge amount of energy beyond what we use today. To put that in perspective, such an increase in oil-equivalent demand would be about ten times the current output of Saudi Arabia.

Oil and gas will continue to be the world's primary sources of energy through 2030, accounting for about 60 percent of the energy supply. For oil, we expect an average annual growth rate of about 1.5 percent through 2030, driven by transportation demand. Oil is used for everything from the fuel that goes into cars, trucks, airplanes, and ships to the asphalt in the roadways and runways.

We also expect ongoing shifts in oil demand growth among regions in the world. For example, oil demand in the mature markets of North America, Western Europe, and Japan is forecast to grow on average at less than half a percent per year. On the other hand, China – which had growth in oil demand of about 15 percent in 2004, accounting for almost one-third of the increase in global oil demand last year – has a much higher long-term growth rate (closer to 4 percent per year on average), and a large part of that growth will come in the transportation sector. At that rate, China

will represent about 14 percent of world oil demand by 2030 – twice its share today.

So the demand growth for oil will continue at a steady pace globally, but the centroid is beginning to shift from North America and Europe to the East, primarily driven by transportation and concentrated in Asia Pacific.

We see demand for natural gas rising over 2 percent per year, increasing to a 25 percent share of total energy by 2030. Because gas is both economically and environmentally attractive, it is a preferred fuel for power generation in many markets. This has made natural gas the fastest-growing source of conventional energy.

Europe and North America will continue to have substantial energy resources available within their regions, but both will increasingly draw upon imports. The energy supplies that these consuming areas will use will increasingly come from the Middle East and Africa, as well as Russia and the Caspian.

The interdependence of these future energy movements between supplying countries and consuming countries – both for oil and increasingly for liquefied natural gas – will raise important issues for ensuring energy development in less industrialized, and in some cases, less politically stable areas of the world.

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Some people might assume that, as an oil company, we may have simply extrapolated "business as usual" and ignored the potential for efficiency in energy alternatives. But that is not the case. In fact, our outlook includes ongoing gains in energy efficiency, offsetting growth in demand about 1 percent per year based upon such things as aggressive assumptions for the introduction of advanced vehicles, particularly hybrids here in the United States.

We have assumed solar and wind, with continued mandates and subsidies, will grow at a 10 percent annual rate – or more than five times as fast as hydrocarbon energy supplies. Nevertheless, the world's growing economies and transportation needs will result in continued demand for petroleum – a plentiful, reliable, affordable, and easily transportable form of energy.

Just as important as the global increase in energy demand, will be the location of the natural resources to meet that energy need.

There is a perception by some in the United States that this country can achieve energy independence. In my view, that expectation is unrealistic. But more importantly, holding that view can be counterproductive. It can distract us from focusing on the reality of the need to deal with U.S. interdependence in the global energy market – an interdependence that will persist well into the future.

There is just no escaping the fundamentals of the way energy consumption is currently met. And that is that about 80 percent of the energy requirements in 2030 will be met by fossil fuels, reflecting their scale, cost-competitiveness and flexibility. But the challenge of providing adequate energy will be considerable, even for those of us who have witnessed the industry's remarkable progress and success over time. Finding and producing these supplies will require a tremendous effort that will occupy the best minds in our industry for a generation.

While alternative forms of energy will make

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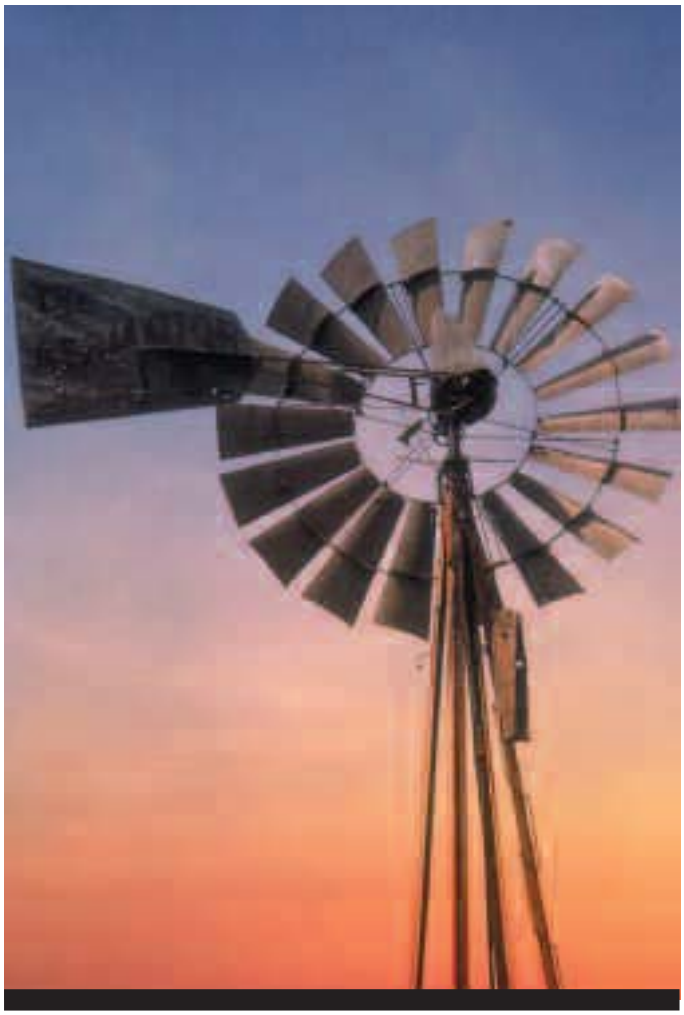

more of a contribution to energy supply over this period (even with the expected double-digit growth rates for wind and solar energy, driven primarily by government subsidies and mandates), their contribution to global energy needs will still be in the 1 percent range by 2030. Some will ask if we might be understating the roles for solar or wind or hydrogen in our outlook. I can understand the question, because these and biofuels have huge federal subsidies designed to accelerate their market penetration.

There are several reasons behind our view of these alternative energy sources. Ethanol from corn, for example, is neither an economic nor an energy-efficient choice. Moreover, it relies on using significant land areas – land that would otherwise go to food crops or forest cover. To give you some perspective, if we tried to replace just 10 percent of the gasoline the United States will use in 2020 with corn-based ethanol, we would need to plant an area equivalent to Illinois, Indiana, and Ohio just to grow the grain needed as feedstock. The difficulty of that can be appreciated when you realize that this area is about one-sixth of the land we currently use in the United States for growing crops.

Solar and wind have other challenges. Wind power is usually more expensive than power supplied via fossil fuels using today's technologies, though its costs can be competitive under ideal conditions. It is constrained by being site-limited, intermittent, and subject to growing objections due to its undesirable visual and noise impacts on the landscape. Solar power is an energy source of significant potential. But it is currently far more expensive than fossil fuels. It also suffers from being intermittent. After all, the sun does go down every day.

And what about hydrogen? Let me say that the jury is still out on hydrogen's long-term

potential. But a few points are important for consideration. First, hydrogen is not an energy source. It does not exist freely in nature. Before it can be used as a fuel, it must be separated from something else, such as oil or natural gas or water. Liberating hydrogen from oil and gas is well understood, but is expensive, and the process requires considerable energy. Liberating hydrogen from water is also understood, but it is even more expensive and energy consuming.

And then there is the matter of new infrastructure to efficiently get such a new fuel into the broad consumer marketplace. We do not yet have practical and economic ways to make hydrogen available for use as a fuel in cars, trucks and buses. It does not have the inherent energy contained in an equal volume of petroleum, it is not easily stored, and there is today no fuels infrastructure to generate, distribute, and dispense it. Additionally, the potential risks associated with widespread use of hydrogen by the consuming public need to be highlighted, evaluated, and dealt with to ensure safe use.

I have recited these various practical issues because they are often overlooked by well-intentioned people who, while genuinely concerned about the environment and our energy future, do not always consider or understand the complexity and scale of the energy system.

What all of this means – and without disparaging the importance of working on alternative energy approaches – is that for decades to come the key issue in energy will be how to find and produce sufficient conventional energy to support global economic activity and prosperity for a growing world population.

Our immediate and ongoing task is to replace the decline in existing production from established and mature producing areas. We must add additional supply capacity to both replace the decline in current production, plus meet a continual growth in demand for oil and natural gas. The search for these new supplies has led the industry to largely undeveloped and physically challenging parts of the world.

Some of these areas are remote from major consuming

markets and lack sufficient infrastructure to build new bases for long-term operations. Others are even more challenging and have no transportation system to move produced volumes to the market. The places where most new production will come from are increasingly in countries where we in the private sector have not historically operated. Though these realities make doing business more challenging in many ways, they can all be successfully addressed by applying the proper business fundamentals and by playing to the traditional strengths of our companies and our industry.

The response to these new challenges is technology. Technology is the lifeblood of our ability to pursue opportunities in new geographic locations and ever-harsher climates. Our approach and business strategies are built upon a strong commitment to technology and the belief that technology is vital in rising to the challenge of providing reliable and affordable energy supplies to the world. Technical advances in both exploration and production have driven success in finding more resources and in producing them economically.

For example, in Qatar, the integration of new technology into project planning and execution has led to a substantial reduction in the cost of producing and transporting liquefied natural gas, allowing this new source of energy supply to become economic for markets here in the U.S. Further advances in large new ship designs will soon significantly lower the cost of delivery, opening up more markets in which these resources can compete.

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All the international oil companies are pursuing large, high-quality resources – all are looking for petroleum in areas that offer the promise of new discoveries and future production. But since its inception, the petroleum industry has faced and overcome challenges that at the time may have seemed insurmountable. And today, we have a new set of technical and geopolitical challenges. Many of the new resources are in ever-deeper water and more-difficult environments, ranging from arctic conditions to jungle conditions, and distant from the major consuming markets.

The industry is working to produce oil in the Caspian Sea, which is both relatively remote from major fabrication facilities and ice-bound during several winter months. This area is only slightly more hospitable than the conditions we face in developing our project offshore Sakhalin Island in the Far North East of Russia. And offshore Africa, we routinely discover oil in many thousands of feet of water.

The years ahead will present significant challenges as we work to increase the world's production base and to maintain the financial strength required to pursue these important opportunities. The shift to new areas with evolving relationships and roles, and to resources that pose increased technological demands, are challenges the industry has faced before.

However, the history and experience of the industry in adjusting to such changes in technology, geopolitics, market forces, and social expectations convince me to remain optimistic. But it is essential to understand that for

the next several decades the United States and the rest of the world will need increasing amounts of oil and gas to meet energy needs and to support economic growth.

What are the geopolitical and national political implications of that reality?

First and foremost, the rest of the world and the United States will increasingly need energy from the Middle East. This is not a matter of ideology or politics – it is simply inevitable. By some estimates, about 50 percent of proved worldwide oil and gas reserves reside in the Middle East. Saudi Arabia alone has about one-fifth of the world's oil reserves. We need to accept the reality of this rather than undertake expensive and risky steps trying to avoid it.

Without question, the key to managing the risks for America's and the world's energy future is to broaden the base of geographic locations from which we get our oil and gas. There are other regions that will be increasingly important as suppliers of petroleum. Sub-Saharan Africa will be one of these, as will Russia and the Caspian. Very-heavy oil from Venezuela is also an important source.

As a country, we need to think carefully about the nature of our relationships with countries in these regions, as well as those in the Middle East. We will also need to muster the political will, based on a realistic energy outlook, to allow further development of the energy resources to be found right here in the United States. This includes those that may be offshore California and Florida, in the Rocky Mountains, and in northern Alaska.

If we do not explore and develop energy from prospective areas here in the United States, the consequence will be even greater dependence on energy from areas such as the Middle East. We must remain committed to use energy more efficiently by ensuring that competitive markets are in place to provide the necessary free-market incentives.

The energy industry must have not only the incentive, but also timely and visible government support, for investment in new regasification and pipeline facilities. For example, we must ensure that liquefied natural gas (LNG) can be brought to this country to meet growing natural gas demand. The energy invest-

ments required to meet the world's growing demand will be huge. The International Energy Agency estimates about $200 billion in investment will be needed each year to develop and supply the oil and gas that the world will need through 2030. When we look to the future, we can only wonder at what challenges and new solutions through technology await the petroleum industry in the 21st Century.

Today's petroleum industry operates in a fiercely competitive global marketplace. The challenge of supplying energy for the future of our world is immense – but there is good reason to be confident about our ultimate success.

Rex W. Tillerson is President of Exxon Mobil Corporation.

A native of Wichita Falls, Texas, Mr. Tillerson earned a Bachelor of Science in Civil Engineering at the University of Texas at Austin before joining Exxon Company, U.S.A. in 1975 as a Production Engineer. He held several engineering, technical and supervisory assignments in the EUSA

Production Department throughout Texas and in 1987, was named Business Development Manager in the EUSA Natural Gas Department.

In 1989, he became General Manager of EUSA's Central Production Division, responsible for oil and gas production operations throughout a large portion of Texas, Oklahoma, Arkansas and Kansas.

In 1995 he was named President of Exxon Yemen Inc. and Esso Exploration and Production Khorat Inc., and in January 1998 became Vice President of Exxon Ventures (CIS) Inc. and President of Exxon Neftegas Limited. In those roles, he was responsible for Exxon's holdings in Russia and the Caspian Sea as well as the Sakhalin I Consortium operations offshore Sakhalin Island, Russia.

In December 1999, he became Executive Vice President of ExxonMobil Development Company. Mr. Tillerson was named Senior Vice President of Exxon Mobil Corporation in August 2001, and was elected President of the Corporation and member of the Board of Directors on March 1, 2004.

Mr. Tillerson is a member of the Board of Directors, of the U.S.-Russia Business Council, a member of the Engineering Foundation Advisory Council for the University of Texas at Austin, the Society of Petroleum Engineers, the American Petroleum Institute, and the Executive Board of the Circle Ten Council, Boy Scouts of America.