The Petroleum Industry in the 21st Century:
Building on a Great Legacy

Lee R. Raymond
Chairman and Chief Executive Officer
Exxon Mobil Corporation
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Thank you Dan. (Yergin) I appreciate your gracious invitation to open this conference, marking CERA's twentieth anniversary.

As recent developments around the globe have vividly demonstrated, we are living in a period of unprecedented challenge and opportunity.

In our host's Pulitzer Prize-winning history of our industry, *The Prize*, Daniel Yergin observed that, "petroleum remains the motive force of industrial society and the lifeblood of the civilization that it helped create. It is still the basis for the world's biggest business, one that embodies the extremes of risk and reward, as well as the interplay and conflict between entrepreneurship and corporate enterprise, and between private business and the nation-state."

Today, the only constant is change. And for the energy business in particular, the changes have been profound.

Today, I'd like to discuss these changes with you and, in doing so, will emphasize the role that technology will play in meeting future challenges.

I have every confidence that our industry's best years lie ahead – surpassing even the greatest achievements of the century gone by – a future in which innovation, technology, performance, and integrity will be absolute prerequisites for success.

We have journeyed far since Spindletop gushed its way into history less than 100 miles from here – two world wars, a Great Depression, revolutions in technology and communications, unprecedented prosperity, and profound changes in the way business operates.

They were challenges of epic proportions. But the petroleum industry met those challenges, and I am certain that we shall continue to do so as we build on this great legacy.

ExxonMobil does business in nearly 200 countries and territories on six continents. And for more than 120 years, we have provided energy and products that have contributed to economic growth and helped improve the lives of people throughout the world.

From our perspective, access to affordable and reliable energy supplies remains essential to the continued progress, prosperity, and well being of the world's citizens. Many of the companies represented here today have contributed to the tremendous advances in the development of petroleum resources during the last century that have improved the quality of life across the globe.

However, there is still much to be done. Some 85 percent of the world's population live in developing countries, where GDP per capita is only six percent of that in the developed world. Some 1.6 billion people have no access to electricity, 18 percent of the world lacks access to safe drinking water, and 2.5 billion are without proper sanitation.

We all have a tremendous opportunity and, I believe, a responsibility to improve the quality of life the world over. We spend our working lives exploring for and producing energy. We transport it, refine it, and manufacture it into countless chemicals and consumer products. Virtually nothing is made without our energy and our products.

We have produced chemicals from which products benefiting billions of people are made – ranging from safety devices, such as automobile airbags, to food packaging and medical garments – an almost endless list.

We know what a difference we make everywhere – to the exporting economies of those with surplus resources that they produce and sell, and to the importing countries whose economies and way of life depend on the energy supplies and products we provide.

As Henry Luce once observed, "business more than any other occupation is a continual dealing with the future; it is a continual calculation, an instinctive exercise in foresight." For the petroleum industry in particular, such foresight remains vital.

Each year, we look closely at the world economic and energy picture, and we try to identify and assess new trends and challenges. No one has yet cornered the market on accurately predicting the future. But I do think we have acquired enough experience to put forward some observations about the forces driving the world's energy markets. As we look at the impact of continuing economic growth on energy demand, several important trends emerge.

First, it is abundantly clear that economic growth will remain the primary driver of energy demand. The global economy has grown at an average rate of about three percent per year since 1970. We expect growth to continue at that pace over the next two decades, with reduced rates of population growth offset by increases in per capita productivity.

We expect energy demand growth to be at a somewhat lower rate, reflecting significant but yet-to-be-achieved advances in energy technology and efficiency. We project that the world's demand for energy will reach close to 290 million oil-equivalent barrels per day by 2020 – or about 40 percent more than today.

We expect conventional fuels will remain the dominant energy source, at least through the mid-century. I would note that we project wind and solar energy will continue to grow rapidly, but only due to government policies and incentives, not market economics. To put this in perspective, solar power can cost somewhere between $100-250 per barrel of oil equivalent. The intermittent nature of solar energy can bring on additional costs.

Starting from such a low base today, wind and solar are unlikely to exceed a one-percent share of the world's energy needs by 2020, even with double-digit growth rates. Thus, oil and gas – representing 60 percent of energy supplies today – will remain the dominant energy source until at least the middle of this century.

This expectation underscores the significant role of hydrocarbon energy today, along with its enduring advantages of low cost and ease of use in multiple applications.

Oil and gas will remain essential to economic growth – not only in the industrialized world, but also in developing nations seeking to raise their standards of living.

When we consider, that as demand increases, our existing base production declines, we come squarely to the magnitude of the task before us. About half the oil and gas volume needed to meet demand 10 years from now is not in production today.

As we have been saying publicly for some time, industry may need to add some 80 million oil-equivalent barrels per day over the next decade to meet projected demand – an amount equivalent to two-thirds of today's production levels.

With such truly staggering investments, we will need to continue to push the technology front, with the help of the best scientists and engineers we can muster. Research and the commercialization of new technologies that expand resource-capture capabilities are critical, as are advances in production technology.

While there are sufficient reserves to meet world demand through at least the middle of this century, meeting the growing energy demand will require timely and successful resource development.

Indigenous oil and gas supplies within mature market areas, such as the U.S. and the North Sea, will struggle to keep pace with demand. As supplies from local production decline, the industry must bring on a substantial number of new and remote developments to fill the gap.

We foresee increased volumes coming from West Africa, Russia, the Caspian, and the Middle East. Given the variation in demand growth rates and shifting supply sources, we also see increasing interdependency between importing and exporting countries.

For example, net oil imports into the United States and Europe may grow by about 3 million barrels per day over the next couple of decades. While those increases are significant, they are dwarfed by an expected increase in Asia's net imports of about 15 million barrels per day.

The prospect of higher import levels continues to raise concerns about security of supply. In our view, the key to security will be found in diversity of supply. Import independence is not realistic in most cases, and it is certainly not necessary if supply risks are managed effectively. Governments can do much to help this effort by promoting diversity through access to resource acreage in all regions.

Related to security, I would also note that government-funded strategic energy reserves are appropriate as a shield against serious harm in the potential event of a severe and sustained supply disruption. But let me be clear. The use – or threat of the use – of strategic reserves as a convenient instrument to merely affect short-term energy prices is inappropriate. Equally undesirable are other actions that would artificially manipulate the market for the purpose of achieving such short-term price reductions. When allowed to work, the free market is exceptionally efficient, and it operates for the benefit of all.

Turning to natural gas, worldwide consumption currently represents about 20 percent of total energy demand. We think natural gas will capture about one-third of all incremental energy growth between now and 2020 and will supply about one-quarter of global energy needs – second only to oil – at about 35 to 40 percent.

This level of growth will require significant transportation and infrastructure investment. We expect LNG supplies to grow fourfold by 2020. Such growth is possible because of technology that allows us to connect more remote gas resources to markets.

I have always found it noteworthy – and disappointing – that ours is seen as an old-economy, low-tech industry.

I think most of you here know better and realize we are one of the most technology-intensive industries in the world. But we have not told our story – and that is our fault.

At ExxonMobil, we invest $600 million a year on research and development. And we do most of it in-house because we think it is essential to our competitiveness.

We now employ about 20,000 engineers and scientists, nearly 2,000 of who hold PhDs in the engineering and hard science disciplines we need worldwide. That is more than the total number of PhDs in these disciplines at Harvard, MIT and the University of California at Berkeley combined. These numbers underscore our belief that the role of science and technology in the public policy arena is absolutely vital if we are to make wise decisions about energy and environmental policies.

Government policies also play a critical role in fostering an acceptable climate for our industry. Increasingly, nations around the world are casting aside the discredited vestiges of totalitarian and collectivist models of government and embracing a free-enterprise framework so essential to prosperity.

In the process, they are addressing their economic issues with market solutions, and reducing harmful economic barriers such as import tariffs, confiscatory tax schemes, quotas, price controls, and competitor restrictions. We applaud these developments – particularly when changes to the status quo require political courage.

We also encourage those who have seen that a clear and stable framework governing legal, fiscal, and regulatory issues is essential to an effective market economy. Sanctity of contracts and predictable tax rates reduce investor risks and will encourage the large, foreign direct investment required to develop oil and gas resources. Where governments do not adopt or enforce a stable framework of laws and regulations, investments become difficult to justify.

The petroleum industry has an ongoing duty to manage its relationships responsibly. We have always endeavored to be a responsible corporate citizen in all the places where we do business. This includes maintaining the highest ethical standards, complying with all applicable laws and regulations, and respecting local and national cultures.

We condemn the violation of human rights in any form, and believe our stand on human rights sets a positive example for countries where we operate and contributes to steady improvements in the quality of life.

As you know, progress in this area is often frustratingly slow, especially in places where free-enterprise models are far from the norm.

The way we conduct our business is as important as the results themselves. In our view, integrity is the cornerstone of corporate citizenship. We expect everyone – directors, officers, employees, and suppliers acting on our behalf – to observe the highest ethical standards.

Another important area that challenges leaders both in our industry and in the world's governments is the need to continually improve environmental performance. The evidence shows that economic growth and environmental improvement are compatible. Data in the U.S. and Europe confirm that air quality has improved significantly despite increases in energy consumption during the past three decades.

In the U.S., for example, lead has dropped by 98 percent, particulates by 75 percent and sulfur dioxide by 39 percent since 1970. Other parts of the world have also experienced dramatic improvements.

In recent years, particular attention has been placed on the contribution of hydrocarbon use to global climate change. Proposals to address climate issues have included approaches that would have an adverse effect on economic growth and prosperity.

Scientific research must continue so that we have a better understanding of global climate change and can reach the best policy decisions. This does not mean we should stand still. We should continue to take tangible, economically attractive actions now, and work with others to develop effective, long-term solutions that minimize the risk of climate change from energy use without causing undesirable social and economic consequences.

In addition to improving our understanding of the underlying science, our company continues to make significant investments in energy efficiency and new technology. In fact, we have been investing money in research and emissions reduction for many years.

Across all of our operations, we devote substantial investments to energy conservation. A noteworthy example is our investment in cogeneration. Cogeneration facilities have been installed at 32 locations worldwide. These units have a capacity of about 2,700 megawatts of electricity – an amount sufficient to supply all residential customers in Maine and New Hampshire.

In combination with cogeneration, we have improved energy efficiency in our refineries and chemical plants by 35 percent during the past 25 years, an energy savings equal to all the gasoline consumed by European drivers for two years.

These improvements have also reduced carbon dioxide emissions by an amount nearly equal to the total annual emissions of the United Kingdom.

Our company also supports efforts with other companies and organizations to develop common and accepted industry standards for measuring carbon emissions. We voluntarily report our emissions and back mandatory reporting based on effective and reliable procedures, as essential preconditions to policies that target emission reductions.

We are continuing important research on long-term technologies including advanced vehicles and fuels, improved internal combustion engines, CO2 separation and storage, and other technologies. And we are also evaluating the use of hydrogen as an energy source.

As you know, the whole topic of hydrogen has been getting more attention recently. There is understandably a great deal of interest in this subject.

On the positive side, hydrogen is abundant, and once delivered to the vehicle, can be used emissions-free. However, it does not exist independently of other elements, meaning that significant energy and costs are required to liberate and distribute it for use in fuel cell vehicles.

When considering any fuel, the entire system of production, distribution, and consumption must be analyzed to assess overall efficiency and emissions -- a well-to-wheels analysis. On this basis, internal combustion engine technology remains the standard against which all alternatives must be measured.

Significant breakthroughs will be required to lower the cost of hydrogen for it to be competitive against the ever-improving performance of the most-advanced internal combustion engine and hybrid technologies. In addition, safety issues around hydrogen will have to be carefully addressed and managed.

To make a real reduction in emissions without impairing prosperity, we will need technology comparable to that deployed in the effort to explore space, to engineer new types of drugs based on recombinant technology or to develop personal computing. This is a major challenge, but one that can be faced with optimism, based on the great strides we have already taken on the frontiers of science and technology.

Most recently, we announced in November that we would invest $100 million in the Global Climate and Energy Project. Stanford University will lead the project, in which scientists and other companies and universities will work on a range of issues associated with energy needs.

This unprecedented alliance of scientific researchers and the other participating companies of General Electric, Schlumberger, E.ON, and Toyota will work to find innovative and commercially viable new energy technologies that have the capability to substantially reduce greenhouse-gas emissions. These will include identifying the most promising technologies, accelerating their commercial applications, overcoming cost, performance and safety issues, and publicizing the results.

We are committed to ensuring that the output of this initiative is shared with others beyond Stanford University and the business sponsors. Both the research itself and dissemination of the project's findings will explicitly consider developing countries, where much of the growth in emissions will occur.

I believe that the partnership and collaboration of global companies and the world's leading university researchers on these matters will ultimately prove to be of great strategic importance.

The Global Climate and Energy Project holds great promise for delivering new technologies that can give policymakers more options and help us continue to produce reliable and affordable energy while reducing environmental impacts in a cost-effective way.

The record shows that our industry has been remarkably successful in finding and providing affordable energy. We have accomplished this very difficult task while at the same time operating profitably to the benefit of our shareholders. Moreover, we have seen that the energy we provide has contributed significantly to human welfare in every part of the world. Central to the success of that undertaking is integrity – integrity in our actions, honesty in our communications, and the courage to seek the truth and to communicate it to the public, even when doing so flies in the face of popularity or expediency.

We cannot expect others to tell our story for us. It is up to all the members of our industry – and its leaders here today – to delineate and emphasize our common interests and objectives.

In our areas of agreement, we can be exceptionally effective – and we can exercise that effectiveness for the benefit of all humanity. In our areas of disagreement, the issues should be carefully defined and technically resolved as much as possible.

People the world over count on us and trust us to meet their vital needs each day. The goods and services we provide offer tangible benefits to billions of our fellow human beings – a truly remarkable performance.

Permeating our history is a steady determination that manifests and proves itself in periods of great challenge. We have been responsible for extraordinary technical advances that have increased energy supplies and made them more affordable.

Our industry has worked diligently and successfully to reduce the environmental impact of our operations, even as we have seen many positive environmental developments as cleaner energy replaces wood, coal, and animal waste.

We provide important health services in developing countries, and we often work with public authorities to establish health clinics and to construct projects such as systems to provide safe drinking water. We have also developed operating practices and programs that contribute to positive social change in the developing world.

These are extraordinary accomplishments and should be a source of pride for all of us. They should also strengthen and renew our

confidence that we will meet the test of future challenges that will inevitably arise.

Periodically, various critics – some well-meaning but misinformed, others with ideological agendas – announce the impending demise of our industry. Little do they know the men and women who have created and manage the world's petroleum business – or the tough fiber of the scientists, engineers, and explorers upon whom its future depends.

Since the advent of the Industrial Revolution, civilization as we know it has been built on abundant, reliable, and affordable supplies of energy. This will also be true of our civilization tomorrow.

We should build on the great legacy that is the petroleum industry, be worthy heirs to the achievements of its storied past, be wise stewards of its present actions and future plans, and bequeath to tomorrow's generations an inheritance that benefits all people. In our increasingly global enterprise, as political barriers give way to economic progress, the petroleum industry will continue to lead the way. It is a pleasure and a source of great pride to be with you today and to discuss the challenges we will face together in the years to come.

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