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Bridging the Energy Gap
through Interdependence and Innovation

[Acknowledgements] It is a pleasure to join you for this year's Offshore Northern Seas conference.

Now in its sixteenth year, ONS has firmly established itself as one of the most important industry events in Europe.

Important because of the vital role our host plays in the global energy system. Norway is the world's third largest net exporter of petroleum, contributing over 2.5 million barrels a day to the international supply pool.

This production is a testament not only to Norway's natural resources, but also to the resourcefulness of the Norwegian people.

When drilling started on the continental shelf forty years ago, Norway's oil industry consisted of about 200 persons. Today, the industry here, including service providers and authorities, numbers over 225,000.

Through free trade, international partnerships, and a continued commitment to technological development, Norway has capitalized on the resource wealth of its continental shelf not only to its benefit, but also to the benefit of the entire European continent, and beyond.

ExxonMobil, including our affiliate Esso Norge, is privileged to have done business here for well over a century, and in the upstream, for more than forty years.

And today, we are proud to employ over one thousand Norwegians… account for approximately 10 percent of Norway's total oil and gas production… and rank as Norway's fourth largest company.

ONS is important for another reason, however. Over the years, it has become a true international gathering, attracting industry and government leaders from nearly half the countries of the world.

Interdependence and Innovation

In this way, it has become a demonstration of our energy *interdependence*. In a nation which produces far more energy than its domestic economy requires, a nation with no "energy gap" of its own, we gather to consider the potential energy gap the world faces, and the ways of bridging it.

Why? Because not even Norway is independent of global market forces. Pre-tax prices for fuels and products sold here respond to world events elsewhere, as they do in nearly every industrialized nation. And as Norway's continued embrace of world markets suggests, the benefits of energy to this nation are interdependent with the benefits of energy to all nations.

Today, I would like to focus my remarks on our global energy interdependence – not just its necessity, but its virtue. And, in particular, I would like to focus on one important dimension of this interdependence – the role of technology.

Through partnerships between producing and consuming nations and through participation of international energy companies in developing national resources, we open up new opportunities for technology development and transfer, and ultimately new opportunities for economic progress.

The Energy Gap

Fundamentally, the energy gap we speak of is the divide between growing energy demand worldwide and global energy supplies.

On the demand side, world consumption of energy in all forms is expected to increase 60 percent by 2030.

To put this in perspective, it requires new supplies of energy equivalent to 125 million barrels of oil a day, or over 40 times Norway's current rate of oil production.

The almost incomprehensible scale of the global energy supply requirement is a particular challenge to this industry in helping the consuming public and policymakers come to grips with realistic energy options and their ability to provide meaningful alternatives to current sources of energy supply.

This reasonably predictable increase in energy demand will be driven primarily by population growth and economic expansion in the developing world. Consider this. By 2030, the energy consumption of Asia-Pacific's non-OECD countries – China and India particularly -- will approach that of North America and Europe combined.

Energy use correlates directly with economic development, and in the hierarchy of human needs, energy ranks high. According to the International Energy Agency, about 1.6 billion people around the world lack electricity, and about 2.4 billion still rely on basic fuels such as wood and waste.

Expanding the availability of clean, reliable, affordable energy is essential to achieving the higher standards of living that people in developing countries demand and deserve.

It is also necessary to address the pressures in many parts of the world to achieve greater social stability and security.

On the supply side, a diverse range of energy sources are available and needed to meet these needs. But as everyone gathered here is well aware, only fossil fuels, which provide 80 percent of the world's energy needs today, can meet the vast majority of these needs for the foreseeable future.

And oil and natural gas, which provide 60 percent of global energy consumption today, will remain predominant well into the middle of this century in part because they are found in abundance and because they can be delivered safely, reliably and affordably in the forms that people require for transportation, power generation, and industrial uses.

Of the world's recoverable conventional oil resources, only one third has been produced so far. Factor in the enormous amounts of unconventional resources – such as heavy oil and shale oil – and it is clear that there is sufficient oil for decades to come.

The challenge is continuing to bring these vast new resources to market and to manage currently producing resources safely, with care for the environment, and efficiency to maximize their value.

There has never been an era of "easy oil" – our industry has constantly operated at the technological frontier. Oil only seems easy after it has been discovered, developed and produced.

That is certainly the case in the North Sea. The technologies required to continue searching for and tapping these resources in a technically-feasible, cost-effective, and environmentally-sound manner seem formidable to us today. One day, those who come after us will refer to our activities as the "age of easy oil."

An example is the Kristin project in the Northern North Sea, a joint venture of ExxonMobil, Statoil and other partners which first began production less than a year ago. To safely produce high volumes in this area's high-pressure, high-temperature subsea conditions required advanced technologies in drilling practices, materials and facilities design, and transportation.

ExxonMobil's recent exploration well at Kogge is another example. It was Norway's deepest well ever at 5,837 meters total depth, employing leading edge drilling technology and application of new geologic modeling approaches in a high risk, new play area.

The Ormen Lange project, a $10 billion project in which ExxonMobil is a partner, also represents a triumph of technology. The 13 trillion cubic feet of gas to be developed

from the field will be transported by an undersea pipeline over 1,200 kilometers in length – the world's longest.

Technologies to Bridge the Gap

Ongoing advances in technologies enable us to bridge the energy gap and bring new resources to market to meet growing energy demand.

These technological advances and their application represent years of geoscience and engineering development to realize the value from the resource for which the risk and cost to discover were undertaken many years in advance as well. For example, the discovery wells at Kristen and Ormen Lange were drilled in 1997 - almost a decade ago. It is the nature of our industry to take huge risks involving large amounts of risked capital years in advance to meet the world's energy needs, because that is the nature of the enormity of the challenge.

We take these risks with the view that we will develop needed technologies to realize the value of these resources one day. These are aspects of our industry that the consuming public and policymakers have difficulty grasping -- the significant upfront risks, investments and the long timelines before revenues are realized.

The advancement of technology spans the full length of the energy supply chain.

Multi-dimensional seismic mapping tools have enabled us to better understand the sheer size of the Earth's hydrocarbon endowment, uncovering more potential and progressively increasing our estimates.

In 1950, the U.S. Geological Survey estimated that the world's conventional recoverable resource base was about 1 trillion barrels. Fifty years later, that estimate had tripled to 3 trillion barrels.

Why? Someone concluded in 1950 that the "age of easy oil" was over. We consistently underestimate the resource potential that technology will bring through the window of opportunity.

Deepwater technologies, such as those employed in the North Sea, enable us to go where no one has gone before, to water several times deeper than Norway's tallest onshore structure.

To overcome challenging arctic conditions such as those found in Russia's Far East, we utilize ice-resistant and ice-breaking technologies that transform inaccessible resources into accessible ones.

Breakthroughs in directional drilling have led to similar transformative results. These technologies have enabled us to drill a horizontal well from an onshore rig to an undersea

reservoir nearly 10 kilometers away with precision. Not only does this enhance our energy production, it reduces our environmental footprint.

Transport technologies are likewise important to bridging the energy gap by enabling us to span greater distances on the world energy map.

Norwegians, leaders in international shipping well before first discoveries of oil, will appreciate this. ExxonMobil's next generation of liquefied natural gas tankers carry up to 80 percent more natural gas than conventional LNG ships, making it possible to deliver new sources of energy from the Persian Gulf to Northern Europe and to essentially any market on the globe at competitive prices.

In refining, the development and application of advanced catalysts enable us to convert ever heavier crudes into even cleaner fuels and products, reducing the environmental impacts of their use.

They have also made our refineries more energy efficient and achieve greater levels of throughput, enabling us to increase refining capacity worldwide to keep pace with global demand for oil products.

Finally, new technologies have also directly benefited the consumers of our products. Cleaner fuels, more efficient engines, and more lightweight materials from petroleum-based plastics not only help reduce costs and extend the life of energy supplies, they also help promote energy efficiency and reduce emissions.

Technology already plays a critical role in reducing the environmental impacts of fossil fuel use and further advances will provide opportunities to continue to mitigate the impacts of greenhouse gas emissions from the inevitable growing use of fossil fuels.

Carbon capture and storage technologies, for example, have significant potential to reduce greenhouse gas emissions. These technologies separate carbon dioxide from a gas stream, compress it to reduce volume, and transport it by pipeline to a storage site.

One of the best-known and longest-running carbon capture and storage sites is in the Sleipner Field in the North Sea – a project in which ExxonMobil shares ownership.

To duplicate the successful application of this technology elsewhere, ExxonMobil is pleased that CO_2ReMoVe, a major research initiative sponsored by the European Commission, will be using the experience gained at Sleipner and Snohvit to help validate the environmental potential of carbon capture and storage technologies.

Carbon capture and storage technologies are also a focus of research at the Global Climate and Energy Project, based at Stanford University in California and sponsored by ExxonMobil.

Here some of the world's best scientific and engineering minds have been working -- in collaboration with other leading institutions such as Delft University of Technology, the Energy Research Centre of the Netherlands, and the Swiss Federal Institute of Technology in Europe -- to better understand the scientific, economic, and technical aspects of this innovation.

They are also researching other promising technologies, such as ways of making hydrogen energy more economic and safe… combustion engines more fuel- and emissions-efficient… and sources of biofuels more abundant.

Such potential breakthrough technologies may one day dramatically alter the energy-economic-environmental equation.

Conditions for Technological Progress

How do we continue this technological progress? We must create and maintain conditions conducive to ongoing research, development and application of new technologies worldwide. This is a challenge we all face – industry, governments and consumers alike.

It requires investment. Last year, ExxonMobil invested nearly $700 million in research and development. In fact, we have maintained our investment in R&D during periods of high oil prices as well as low oil prices. It is the nature of this business.

Last year, we also spent more than $17 billion in capital expenditures, including $2.8 billion in Europe. We expect those numbers to be even higher this year. Such investment is needed across the industry. And to encourage such investment, stable fiscal terms are needed – even in times of high earnings.

Technological progress also requires access. By providing timely access to oil and gas resources, governments enable energy companies to bring the full extent of their technology and know-how to bear to new supply opportunities. This benefits resource owners and users alike in terms of higher values, lower costs, greater supplies, and reduced environmental impact.

Open and reliable access also spurs future technological progress. The two are related. Most energy technologies are developed with specific resources in mind. If these resources are made off-limits, the incentive for R&D is reduced.

Continued progress requires the international transfer of technology, too. Many developing countries have yet to take advantage of technological gains in increasing energy efficiency and reducing emissions. With most of the increase in future energy demand – and 80 percent of the future greenhouse gas emissions – expected from non-OECD countries, sharing these technologies will be increasingly important to meeting economic and environmental expectations.

Finally, technological progress depends on cultivating scientific and engineering expertise.

Norwegians have a unique word for this idea – "kunnskaping." It roughly translates into English as "knowledging," meaning value creation through intellectual capital formation.

By raising the next generation of scientists and engineers and by building the knowledge base, we create the conditions for future technological progress.

Each of these conditions – investment, access, transfer, and knowledge – are all elements of energy interdependence. The international competition of goods, services and ideas enables the sharing of vital resources and knowledge. It can be said that markets are the mother of innovation, and ultimately, of progress.

Governments play an important role in this market-based progress. In some cases, artificial national barriers to competition can slow technological development and limit the long-term value of energy resources for suppliers and consumers alike.

Alternatively, by providing access, creating a stable business and regulatory environment, and supporting education and pre-commercial research and development, governments support this competition.

Conclusion

Eighty-five years ago, a native of Stavanger named Christian Lange was awarded the Nobel Peace Prize for his work in promoting what he called "internationalism."

In his acceptance speech in Oslo, Lange said that "today, we stand on a bridge leading from the territorial state to the world community." It is a bridge, he went on to say, based in part upon "worldwide markets."

Lange's words are as relevant today as they were then, if not more so. And the bridge he spoke of is the same that can enable us to span the global energy gap.

Through energy interdependence, we can continue the technological progress needed to develop the energy supplies to meet the world's growing energy demands. That is the bridge we must build – and cross – together.

Thank you.