The EU and Norway are the world’s fourth largest producer of oil & gas

It’s about time… and innovation
Oil and gas are natural fuels. The energy they contain was generated by the sun millions of years ago and absorbed by prehistoric micro-organisms and plants. It has been locked into their remains ever since. Over the course of time, as the Earth’s crust shifted, these organic materials were subjected to intense heat and high pressure. Such activity turned some of this organic matter into liquid and vaporous hydrocarbons – more commonly known as oil and gas. And some of that oil and gas became trapped in porous sedimentary rock layers called ‘reservoirs’. Oil and gas reservoirs can be several kilometres below the earth’s surface.

Although quantities of oil and gas travel to the surface naturally through seepage and venting, the rest is more elusive. First, oil and gas need to be found underground on land or even beneath the seabed. This is done using techniques to look for the geological structures that might contain promising reservoirs. Then it is necessary to drill into that rock.

Most wells prove to be dry. Innovations in seismic technology are, however, improving the industry’s ability to drill where oil and gas are more likely to be found.

The first commercial oil wells were drilled in the mid-19th century. Since then, oil has served as a fuel (now mainly for transport) a natural lubricant and a chemical feedstock on an increasingly large scale.

In one form or another, such feedstocks provide essential components for houses and roads. They make fibres for clothes. They form vital ingredients for health care. And they help to grow, protect and preserve the world’s food supplies.

Natural gas, with its cleaner burning properties, first became widely available in the late 1960s. More recently, gas has become the fuel of choice for power generation. The development and use of gas has contributed significantly to a lower carbon economy by making it possible for Europe to be less dependent on oil and coal.

Increasing supplies of oil and gas

In 150 years of intensifying use, the world has consumed about 1 trillion barrels of oil and 66 trillion cubic metres of gas – which provided the energy equivalent of another 430 billion barrels of oil.

Thanks to growing investment in exploration and production – and innovative technology – oil and gas proven reserves have been increasing steadily since the 1980s. In 2008, proven global oil reserves reached some 1,300 billion barrels.

At the same time, annual global consumption was approximately 31 billion barrels. Therefore, at that rate of consumption, the world has enough oil for some 40 years. This figure has remained almost constant for the past 25 years as new discoveries

EEA oil & gas proven reserves

|                | Oil: ~14 billion barrels | Gas: ~38 billion barrels of oil equivalent |

Source: BP Statistical Review of World Energy 2009
and/or the exploitation of remaining resources have offset the quantity of oil produced and consumed.

Further exploration and production will yield enough oil to last well beyond the middle of the 21st century.

**Gas: a promising future**

The future for gas looks even more promising.

In 2008, proven global gas reserves reached 185 trillion cubic metres, equivalent to 1,220 billion barrels of oil. At that time, the world was consuming about 3 trillion cubic metres (or around 20 billion barrels of oil equivalent) a year. At this rate of consumption, the world has enough gas for some 60 years, also a constant figure for the past 25 years.

Again, further exploration and new finds will prolong the availability of gas supplies.

Within the European Economic Area (EEA), proven reserves of oil and gas remain substantial. In 2008, there were around 14 billion barrels of proven oil reserves and about 38 billion barrels of oil equivalent gas remaining in the ground. Which is just as well, since the use of oil and gas will remain crucial to Europe, particularly during the region’s transition to a low-carbon economy.

In addition to proven reserves, certain amounts of oil and gas are known as ‘probable’ and ‘possible’ reserves. These can exist in already discovered fields or in acreage yet to be explored. Together, these sources of oil and gas are called ‘remaining recoverable resources’.

Such resources are plentiful. The International Energy Agency (IEA) estimates that there are some 2.4 trillion barrels of conventional oil and some 405 trillion cubic metres of conventional gas (equivalent to 130 years of production at current rates) of remaining recoverable resources.

That amounts to global oil and gas remaining recoverable resources of some 5 trillion barrels of oil equivalent. Such volumes are more than enough to meet projected demand until alternative forms of energy become technically and economically more viable.
Europe is fortunate in its access to oil and gas. The region is the world’s fourth largest producer. The North Sea basins contain Europe’s largest oil and gas reservoirs.

While production has started to decrease in recent years, it is worth remembering that when the North Sea fields were first discovered in the 1960s they were expected to run out well before the year 2000. Clearly, that did not happen. So European production continues to meet a significant part of Europe’s oil and gas demand.

Why?

Because major investment in new technology has prolonged field life and recovery factors. New technology has also enabled European producers to tap into reservoirs that were considered beyond reach as recently as 20 years ago.

### % of demand met by EEA production

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil Demand EEA</th>
<th>Gas Demand EEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>12%</td>
<td>58%</td>
</tr>
<tr>
<td>2015</td>
<td>9%</td>
<td>54%</td>
</tr>
<tr>
<td>2030</td>
<td>5%</td>
<td>37%</td>
</tr>
</tbody>
</table>

Sources: IEA World Energy Outlook 2009 with OGP assumptions made on oil production in Romania and oil & gas demand in Norway.

#### Assessing seismic data

![Assessing seismic data](image)
Prolonging production life

Appropriate policies, including long-term and competitive regulatory and fiscal regimes, encourage additional investment. This can add decades to the life of oil and gas production in the North Sea and other offshore and onshore areas in the EU such as Romania, Denmark and Italy.

Prolonged indigenous oil and gas production will also boost the income of the EU’s Member States and their people.

The upstream oil and gas industry already contributes significantly to GDP in terms of tax revenues and royalties. It also provides employment – directly and indirectly – for a considerable number of people throughout the EU. In 2009, in the UK alone, the industry contributed more than €14 billion to government revenues and supported some 450,000 jobs.

Extended oil production will also make use of the region’s considerable refining capacity, thereby enhancing security of product supply.
Proven gas reserves
2008

Source: BP Statistical Review of World Energy 2009
Gas and a low-carbon future

In the 1960s, a number of EU countries made the conscious decision to add natural gas to their energy mix.

Gas will continue to be a vital fuel in the low-carbon economy of the future, thanks to its availability and cleaner-burning properties. It produces the lowest amount of CO₂ of any other fossil fuel – half that of coal.

Gas is also a particularly flexible fuel, which makes it the only viable back-up to wind power-generation. Moreover, there are large gas reserves already available, both within the EEA and from external countries.

European countries can ensure that the region benefits from an extensive internal gas distribution network. Equally important is a large-capacity transportation network that extends to key neighbouring supply regions and receives liquefied natural gas (LNG) by tanker.

These regions include some of the world’s biggest producers, encompassing not only Russia but also the fields of the Middle East, the Caspian states, the African Mediterranean coast and West Africa. By cultivating and balancing all of these sources, Europe can enhance its overall security of energy supply.

For LNG, advancements in technology have enabled the construction of larger special tankers and the terminals that can unload their cargos. Consequently, gas can now be transported cost-effectively around the world. As a result, natural gas is increasingly becoming a global commodity – less susceptible than ever to geopolitical issues.

Even closer, there is additional potential from the European Arctic.

The Barents Sea, for example, covers a vast area of some 1.4 million square kilometres. Major developments include 81 exploration wells. Since 1980, 27 exploration and production companies have become active there.

For good reason.

The Arctic contains a significant amount of undiscovered, technically recoverable resources. One estimate puts volumes at around 448 billion barrels of oil equivalent. Most of the resources (84%) are offshore.

As a result of these developments, Europe is well-positioned to enjoy the benefits of natural gas. However, to increase the benefit, there is an enormous amount of investment required.

‘Gas will continue to be a vital fuel in the low-carbon economy of the future, thanks to its availability and cleaner-burning properties. It produces the lowest amount of CO₂ of any fossil fuel – half that of coal.’
Europe is particularly promising for unconventional gas and may have some 35 trillion cubic metres in place. Most of the potential is located in Bulgaria, France, Germany, Hungary, Poland, Romania, Sweden and the UK. Development will depend largely on continued technological advances, gas prices, fiscal regimes, and transmission infrastructure.

Similarly, despite the headlines about ‘peak oil’, new ‘unconventional’ sources of hydrocarbons – oil sands, shale, tight gas and coalbed methane – have considerable potential. The IEA estimates that there are around 6 trillion barrels of unconventional oil and 921 trillion cubic metres of unconventional gas in place around the world. They are more difficult to find and produce than conventional hydrocarbons. The development of new and advanced technologies and techniques will show to what extent unconventional hydrocarbons will be able to fill any gaps caused by a decline in conventional supplies. In the US for instance, unconventional gas has, in recent years, become mainstream and now accounts for over 50% of domestic production.
The Beryl field in the UK sector of the North Sea (see page 4) provides a good example of how innovation and investment can prolong the life of an oil field. Beryl was discovered in 1972 and started producing four years later. Its operator expected the field to produce 400 million barrels of oil equivalent over a lifetime of 25 years.

Some 33 years later, Beryl had in fact produced over 1 billion barrels of oil equivalent itself, with another 300 million barrels from associated fields.

A new €138 million drilling programme will extend the field’s productive life even further.

What is true of the Beryl field is true of many fields the world over. Yet even now, the average recovery rate is 30-35% of the conventional oil in the ground. Each 5% improvement in recovery factor across all fields yields another five years of global supply.

Recovery rates can continue to improve through special drilling techniques and by raising the pressure in the reservoir by injecting water or gas, thereby forcing more oil to the surface.

In some cases, the gas injected could be CO₂ recovered from power plants. This process, known as carbon capture and storage (CCS), can be particularly effective in reducing emissions. According to the European Commission, some 30% of CO₂ emissions from the power sector could be captured in this way by 2030 – rising to almost 60% by 2050.

There is another advantage to new recovery techniques. They bring more oil and gas to the surface without expanding a field’s environmental footprint.

Snøhvit in the Barents Sea is a major development on the Norwegian continental shelf with no surface installations. The seabed facilities are designed to allow trawler fishing in these rich waters to continue while production is underway.
Progress will continue to be made in developing alternative and renewable sources of energy. Nevertheless, oil and gas will still be needed to meet at least half of the world’s energy needs for the foreseeable future.

IEA forecasts show that Europe will be up to 65% dependent on gas imports by 2030. They also show that gas demand may rise from some 500 billion cubic metres (bcm) per year to over 600 bcm. World-wide, demand is expected to rise more dramatically.

Meanwhile, Europe’s supply regions – both indigenous and external – are exposed to natural decline. The IEA estimates that if new investments are not made, this natural decline will halve supply by 2030. In other words, there is a pressing need to develop an additional production capacity of 250 bcm within 20 years in order to sustain gas consumption in Europe at current levels. This highlights the importance of encouraging timely investment in new and enhanced European production while simultaneously securing investment in diverse sources from beyond Europe.

To avoid any shortfalls in supply, that work must begin immediately.

The lead time for routine oil and gas projects can be anything from 10-15 years for routine production. Extra time is needed for more challenging projects, such as those that require subsea wells drilled through six kilometres of rock and salt. In other words, the time to enable supplies in 2025-30 is now.

Access, too, is an issue – particularly in areas of environmental sensitivity. Yet as experience has shown, highly sophisticated drilling and production techniques can answer ecological concerns.

Naturally, such techniques are also costly. And investment can only be made in policy and fiscal regimes that inspire confidence in terms of long-term stability and risk management.

**Policy goals to consider:**

- Competitive regulatory and fiscal regimes to encourage timely investment in field development and production capacity
- Pragmatic and timely access conditions to remaining recoverable resources and proven reserves, including new exploration areas
- Realistic demand signal and predictions for gas. This is vital for companies as it influences the timeliness of investment decisions
- Supply links, both at the political and infrastructure level, to neighbouring oil and gas producers
- A level playing field of policies for all energy sources

‘Oil and gas will still be needed to meet at least half of the world’s energy needs for the foreseeable future.’
Barrel of oil: 42 US gallons of oil at 60°F Fahrenheit

Barrel of oil equivalent: a unit of energy based on the approximate energy released by burning one barrel of crude oil. Used to help compare oil and gas reserves in terms of energy potential.

Proven reserves: generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and operating conditions.

Remaining recoverable resources: the total volume of a resource that is both technically and economically recoverable. They include proven, probable and possible reserves in a discovered field, as well as hydrocarbons that have yet to be found, less cumulative production.