



Utilizing the home advantage: Crude oil and natural gas from Germany

- Important contribution to supply security
- Know-how creates international competitive advantage
- Highest environmental and safety standards

Home advantage with tradition

Wintershall, a 100 percent subsidiary of the BASF chemical company, has been producing oil in Germany for eight decades. With a view to this long tradition, the domestic areas are among Wintershall's most important regions in the exploration and production of oil and gas. We are currently producing from 15 oil fields and 35 gas fields in Germany.

Access to international energy markets

In addition, the domestic production also offers a competitive advantage: relative to locations abroad, the production in Germany is more demanding and often only possible with considerable additional effort. Faced with this challenge, the production in Germany with its maximum safety and environmental standards has increased the company's technological expertise. The research also ensures us competitive advantages. For example, one particularly important research field is concerned with in-

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creasing the oil recovery rate from reservoirs. "With the knowledge that Wintershall acquires in exploration and production in Germany, we are successfully positioning ourselves in the producing regions of the world," explains Volker Riha, Head of Wintershall's crude oil and natural gas production operations in Germany. "Since the times of so-called 'easy oil' are also increasingly becoming a thing of the past internationally, we can impress worldwide with the expertise that we have garnered in Germany."

Contribution to supply security

Supply security begins on your own doorstep. In total, around 2.6 million tons of crude oil are produced annually in Germany. This covers only around three percent of the German oil demand, but domestic crude oil production still matches the amount that Germany imports from Saudi Arabia each year. Once again, this demonstrates: Every liter of self-produced oil means independence, security of supply and a strengthened domestic economy. For example, 20,000 people earn their livelihoods in producing crude oil and natural gas in Germany. Around 8 billion euros in production royalties have been paid to German federal states during the last ten years.



High environmental and safety standards are a feature of oil and gas production in Germany.

Importance of oil and gas in everyday life

Germany needs raw materials – today and in the future. There would be no medicines, no wind turbines and no iPads without oil. As a climate-friendly energy source, natural gas is also the ideal partner for renewable energies. Crude oil and natural gas from Germany provide a decisive home advantage for our energy supply. This makes it all the more important that we utilize the resources at our disposal in the best possible way – cleverly and responsibly.

Wintershall's German sites

Wintershall operative center for its exploration and production activities in Germany is situated in **Barnstorf** in Lower Saxony. This is where it creates decisive expertise for new drilling and production projects. In addition to the exploration and production of oil and gas, the Barnstorf site provides various services for Wintershall's sister companies and third parties. This includes the management of pipelines.

Production is carried out in the Aldorf, Düste and **Bockstedt** oil fields in and around Barnstorf – as part of a tradition that dates back 60 years. More than 300 wells have been drilled here. We want to continue developing the existing oil production in Bockstedt in the long term. Six wells were drilled in the in the past two years and additional wells are planned

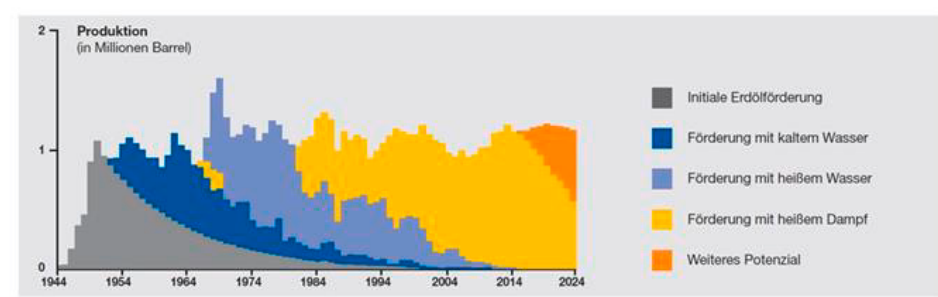
for 2018. They are the result of the seismic measurements that we carried out in autumn 2014. After about one and a half years of intensive data analysis, our geologists and geophysicists have discovered new oil potential.

Wintershall is currently investing around 6 million euros in the construction of a new building for the laboratory facility, which is scheduled to open in fall 2018. This is where approximately 2,000 international rock samples from all of the globally operating company's production regions are processed each year. Since 2012, the volume of orders for the laboratory has increased by around 30 percent. The new building underscores the importance of Wintershall's expertise in the fields of petrophysics, production analytics, and enhanced oil recovery (EOR).

One of the oldest oil fields in Germany, **Emlichheim** is situated on the German-Dutch border. Here, Wintershall has been recovering oil at a consistently high level for more than 70 years – that is worldwide unique. The BASF subsidiary has been using the technically demanding steam flooding process here since 1981.



The steam flooding facility in Emlichheim produces hot steam, which makes the oil easier to extract from the reservoir.



"We believe that this site can also continue to supply Germany with oil for the next 25 years," says Horst Prei, Operations Manager in Emlichheim. Here twelve new wells, which were started in September 2016, are intended to help. They are connected to the well-known Bentheim Sandstone oil reservoir, which lies at a depth of 700 to 900 meters. Wintershall completed this drilling campaign in the summer of 2017.

Eight of the twelve wells will be used for recovering oil, while four of the wells will be used to inject hot steam into the reservoir. Wintershall is injecting this hot water vapor into the reservoir under high pressure at a temperature of 300 degrees Celsius. The oil trapped in the rock warms up, becomes more viscous and flows more easily to the production wells. This steam flooding process has enabled plateau production to be achieved at the site for a uniquely long period in international comparison. In combination with the horizontal drilling technique, this results in an above-average oil recovery rate of more than 40 percent – usual is

about 30 percent. "And we want to continue getting the oil 'steamed up' like this in future," says Prei.

Wintershall also established the foundation for the development of further oil deposits in the coming decades at the start of 2018. A modern, high-resolution 3D seismic survey completed at the beginning of March enables Wintershall to plan new wells on the German-Dutch border.

The **Mittelplate** offshore oil field, where Wintershall and DEA Deutsche Erdoel AG (operator) both have a 50 percent shareholding, is one of the main cornerstones of Germany's oil production. Over 34 million tons of oil have already been extracted from the reservoir. To ensure Mittelplate can also make an important contribution to domestic production in the future, Wintershall and DEA already initiated another drilling campaign in 2017, which will continue until 2022.

30 years of trouble-free production in the Wadden Sea illustrate how crude oil production and environmental protection can function hand in hand. "Mittelplate is a good example of the environmental standards self-imposed by German E&P companies," emphasizes Riha. "For 30 years this has ensured the safe and environmentally friendly extraction of natural resources, even in the sensitive Wadden Sea production area."

Since production began in 1987, a total of 28 wells have linked the oil field to the Mittelplate artificial drilling and production platform, which is constructed seven kilometers off Friedrichskoog in the Wadden Sea. The drilling platform stands like a compact, liquid-tight steel and concrete basin on the tidal flats. It is protected by sheet pile walls against all external forces of nature. A comprehensive disposal system prevents the North Sea and the Wadden Sea from being polluted by drilling and production operations. In addition to the successful offshore operation, DEA and Wintershall are also recovering oil from the eastern parts of the reservoir from onshore using extended reach production wells. One of these is even longer than nine kilometers in length.

One of the largest oil fields in the Upper Rhine Rift Valley is situated in **Landau** in the Southern Palatinate. The BASF subsidiary has been recovering oil for more than 60 years around the Landau vineyards – a total of around 4.5 million tons. In February 2017, we successfully completed seismic measurements, which were aimed at further developing and consolidating production at the site. The high-resolution 3D seismic survey provides an accurate, three-dimensional image of the geological strata in the Landau oil field. This enables our experts to estimate the still existing oil reserves and locate wells in a precise manner. "We also want the horsehead pumps in Landau to nod in future," says Operations



The Mittelplate oil field is located on the southern edge of the Wadden Sea national park in Schleswig-Holstein, Germany.

Manager Michael Kobel. The seismic evaluation has been completed. Geologists and reservoir engineers are currently determining whether there is potential for possible new wells.

Since 1979, Wintershall has produced about 35,000 tons of oil each year south of Augsburg in the **Großaitingen** region. Wintershall's Bavarian site is thus by far the largest oil production operation in the Alpine foothills – here the oil reservoirs line up like pearls on a necklace. In the end of 2016, we successfully spudded a new oil well and brought it into production in 2017. Further wells are planned.



Wintershall has invested in recent years in the modernization of plant facilities.

In neighboring Bedernau and Lauben (Unterallgäu), Wintershall is also continuing to investigate whether to reopen oil fields that were decommissioned decades ago. Further west in the Upper Swabian region, we carried out a seismic survey in 2015 and analyzed the data. We are thus in a position to investigate whether the oil fields can be reopened.

Domestic natural gas

The political debate on the use of hydraulic fracturing has led to an almost 50% reduction in the production overall of natural gas in Germany. Today, just under ten percent of Germany's natural gas requirement is met by domestic sources – 15 years ago it was still more than 20 percent. If the trend continues, Germany will be completely dependent on supplies from abroad in just a few years. This means that alone in Lower Saxony, already planned investments amounting to billions of euros have not been made.

In the summer of 2016, the Bundestag finally adopted a regulatory package for the future use of hydraulic fracturing, which has now entered into force. The new statutory provisions considerably tighten the prerequisites for allowing the deployment of hydraulic fracturing. For example, its use will generally be prohibited in **unconventional reservoirs** until 2021 – with the exception of four pure research projects.

On the other hand, fracking shall still be possible in **established conventional natural gas production**, i.e. including as part of Wintershall's Düste Z10 project in Barnstorf. Here we have been seeking to develop a tight gas reservoir since 2012. Geological investigations of drill cores from the Düste Z10 well have shown that relevant natural gas potential – up to 10 billion cubic meters of recoverable natural gas – can be expected in the over 4,000 meters-deep reservoir. Concrete implementation of the project for the development of this natural gas field is still uncertain. "Wintershall will provide open and transparent information in a timely manner," says Volker Riha.



Work being carried out on the sour gas production facility at the site in Staffhorst.

Since 1965, Wintershall has been recovering **sour gas** in the Lower Saxony municipality of **Staffhorst** near Nienburg, making it one of the worldwide pioneers in the production of this type of natural gas. Around 95 million cubic meters of natural gas were extracted from eight wells in 2017. Wintershall has completed Päpsen Z2 exploration well and the production has commenced and is highly successful with 7,500 cubic meters per hour. But it doesn't stop there: "We're examining further development potential," says Volker Riha. "This is because Staffhorst shows that the expertise that we garner here in Germany will open the doors to energy partnerships worldwide, for example in Abu Dhabi."

Further information is also available on our Internet portal at www.wintershall.de, where we will continually report on the latest state of planning.

These and other images are available for downloading at www.wintershall.com in the press section.