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Lars Christian Lilleholt:
The North Sea has contributed
to our welfare society

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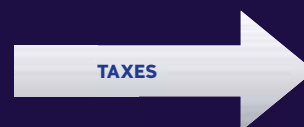
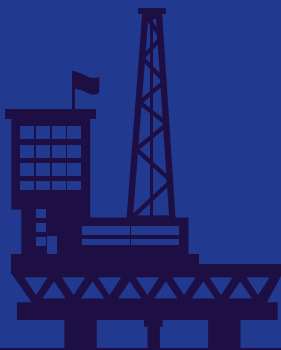
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Future investments
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Increasing demand will
bring the oil price up again

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THE NORTH SEA



The future of the North Sea

The Danish North Sea has since the first oil was produced in 1972 contributed significantly to the development of the Danish welfare state. 4 billion barrels of oil have over 40 years been produced from the Danish part of the North Sea and has delivered about 400 billion kroner to the state. Since 1995 Denmark has been self-sufficient with oil and gas and can continue for many years to come. The industry employs around of 15.000 employees who also contribute to our welfare society. The North Sea has been the engine for growth and activity first and foremost in the Esbjerg region but also in other industry clusters in Denmark.

This we can certainly be proud of.

Denmark as other countries alike needs the oil and gas as part of the energy mix for many years to come. Therefore it will be beneficial for both the society and companies that Denmark's resources are produced. There is still a considerable quantity of oil and gas in the North Sea which the Minister for Energy, Utilities and Climate points out in this Magazine.

The potential is large. At the same time oil companies and suppliers are under pressure. Falling production, ageing facilities in the North Sea, oil accumulations often difficult to access and often in smaller fields, as well as demands for massive cost reductions are all pressing the industry hard. Additionally the low oil price – which apart from lower profitability, also forces the companies to make redundant many highly skilled employees who have been difficult to recruit in the first place.

This development needs to be reversed. We need to increase exploration and find new fields. We need to put in production the already known marginal accumulations. We need to find new technologies which can lift the recovery factor from all fields. And not the least we need to invest massively in infrastructure including life extensions. The industry will do what it can within its means to set this development in motion. However we cannot do so on our own. Therefore we primarily need that the frame conditions for the industry induces companies to commit to these very large investments.

There are no low hanging fruits to pick, and it will take dedicated efforts from industry, Government and authorities to succeed.

We have both hopes and expectations to the ongoing work which is expected to end soon.



MARTIN NÆSBY
Direktør, Olie Gas Danmark

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MINISTER INTERVIEW: Great potential of the North Sea

Lars Christian Lilleholt, Minister for Energy, Utilities and Climate, believes in many years of production from the North Sea
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NORTH SEA STATUS: Everyone is hit by the low price of oil

The halving of the oil price put pressure on both the operators and the sub suppliers.
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Top contributor to the Danish economy

From 1972, when the flow of Danish oil and gas first started, through to 2013, a total of DKK 383 billion has swelled the national state coffers.
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SALES
Daniel Skjøth Christensen & Maria Rahbæk

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The World Needs More Energy

GLOBAL ENERGY CONSUMPTION IS SET TO GROW BY 37% OVER THE NEXT 25 YEARS, WITH OIL REMAINING THE SINGLE LARGEST SOURCE OF ENERGY IN 2040 DESPITE THE STEADILY LARGER PROPORTION OF DEMAND MET BY RENEWABLES

Global energy demand continues to grow. Look 25 years ahead and primary energy consumption will have risen by 37%, despite the falling consumption per capita thanks to increased energy efficiency. These projections come from the International Energy Agency (IEA) in its latest annual report, World Energy Outlook 2014.

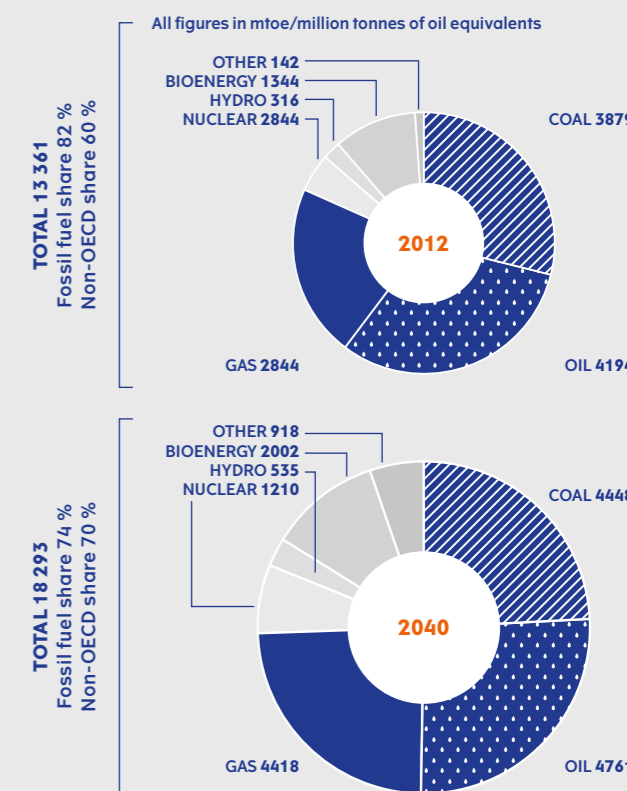
The use of renewable energy might be growing, but fossil fuel resources — oil, gas and coal — will still play a major role 25 years ahead — so major that each of them will account for a quarter of the world's energy in 2040, together providing three quarters of primary supply. The remaining quarter will come from a combination of nuclear power and renewables such as hydro power, biomass, solar and wind energy. For oil alone, daily consumption will rise by 15% to 104 million barrels in 2040.

Foresight analyst Martin Kruse at the Copenhagen Institute for Future Studies nods his agreement. "We see some key trends, where solar and wind energy are approaching the price of energy from fossil fuels. In addition, the world is becoming increasingly more energy efficient, and we finally have shale gas, which could be a big game changer for energy. But regardless of how these factors mutually develop, oil and gas will still be important."

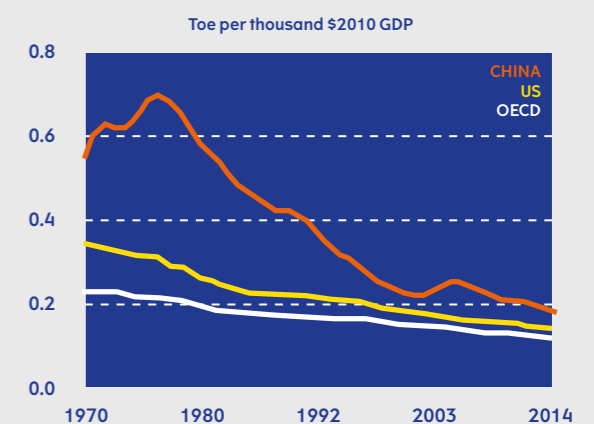
GROWTH BEYOND OECD

IEA anticipates that the greatest increase in energy consumption will come from countries other than the traditional and heavily industrialised members of the OECD. Asia will represent as much as 60% of the expected growth, taking over from the US and Europe as the world's most prolific energy consumer. Technological advances and more efficient use of energy means, however, that the rate of energy consumption per person in countries outside the OECD in 2040 will be lower than within the bloc in the 1970s. The world's most populous country, China, is already well on its way to becoming as energy efficient as the old industrialised countries. The latest energy report from BP shows that China's energy consumption in 2014, compared to its economic activity, was already close to the level of efficiency achieved in the United States and indeed the entire OECD.

Oil and gas will provide half the world's primary energy supply in 25 years time



We have become more energy efficient



THE CONSIDERABLE POTENTIAL OF THE NORTH SEA

The state has banked DKK 383 billion in tax revenues from oil and gas to the end of 2013. It's a substantial sum, which has helped pay for hospitals, schools, roads, railways etc, says Minister for Energy, Utilities and Climate, Lars Christian Lilleholt

◆ **As the new minister, what is your view of the Danish oil and gas sector's contribution to the national well being — to security of energy supply, the tax base and employment?**

The Danish oil and gas industry has never received the praise that it deserves. I believe this strongly. I am proud that we have managed to build a large, commercial industry which has been critical to the success of the Danish economy, so that it no longer stands on the edge of the abyss that [minister of finance] Knud Heinesen described in the 1970s. For many years, revenue from the North Sea has contributed tens of billions of kroner towards financing our welfare state and the sector's activities have created economic growth and highly specialised jobs within the oil companies.

It has often been said that too little value flows to the common good from Denmark's sub soil. In fact, the state banked DKK 383 billion in tax revenues from oil and gas to the end of 2013. It's

a substantial sum, which has helped pay for hospitals, schools, roads, railways and more – all benefits that we would not want to be without.

Today there are a significant number of Danish companies providing services in support of exploration and production in the North Sea. This has contributed positively to employment. It is encouraging to see that many of these companies also work in other countries, using the experience gained through projects in Denmark.

Denmark was self-sufficient in energy for 16 years from 1996 – the only EU country to be so – and we remain net exporters of oil and gas. This provides us with valuable foreign currency and, combined with the expansion of renewable energy, makes us more resilient to recurring fluctuations in global oil prices. I see it as a big plus for Denmark that we have multiple sources for our energy supply, which is based on our domestic production of oil and gas and increasing contributions from wind, biomass and solar. This reduces dependency on a single energy source.

◆ **What future do you see for Danish oil and gas production?**

Oil and gas production has declined in the past ten years, but there are still new discoveries to be made in the Danish North Sea. All seem to agree that the potential to increase production from the fields already in operation is considerable. It will require further technology development, but historically we've been good at finding new ways to recover more oil from tight chalk layers. A new research centre at the Danish Technical University (DTU) will undoubtedly play a key role here.

I am convinced that for many years yet oil and gas will be produced in the Danish North Sea and that it will contribute positively to the well being of the Danish people. It gives us time to continue the development of renewable energy and to increase energy efficiency, so that we can maintain a high level of self-sufficiency as North Sea production wanes.

"It has often been said that too little value flows to the common good from Denmark's subterranean assets. In fact, the state banked DKK 383 billion in tax revenues from oil and gas to the end of 2013," says Minister for Energy, Utilities and Climate, Lars Christian Lilleholt.
Photo: Polfoto



◆ **How can we ensure that Denmark is an attractive investment target given the keen competition from other countries around the North Sea?**

It's really very simple. When we launch a new licensing round, it simultaneously becomes a fierce test of whether the Danish market structure is competitive to that in other countries. The oil and gas industry is of course global, so if the market structure here does not match the geological reality that companies are faced with, they will of course invest their money elsewhere.

For this reason, the high level of interest from oil companies in our seventh licensing round — the energy agency received a record number of applicants — is a positive signal. We will soon publish the results of the round and I look forward to seeing the new licenses that are issued being translated into new exploration, and hopefully also new discoveries.

In future we will conduct each new round of licensing just one year after the previous round is complete. Prior to each round we must ensure that the Danish market remains attractive in comparison with other national mar-

kets. I believe that we can best achieve that by providing a stable tax structure. Frequent changes in tax rules creates uncertainty for companies investing in the sector.

The industry has indicated that accelerated depreciation is something that ought to be considered in connection with infrastructure investments. That is something the government will take a closer look at.

◆ **What are you expecting to emerge from development of a long-term strategy for the North Sea?**

I look forward to seeing a series of recommendations that can ensure a more effective utilisation of our North Sea resources. In my opinion it is with urgency that we need to launch initiatives in this area, as some companies have decisions pending for major investments.

In particular I expect the report to focus on how to optimise infrastructure, which must undergo significant investment if production is to be maintained. We have to move away from development of infrastructure that meet the needs of a particular producer. Instead, infrastructure should be optimised for

the benefit of all the production potential in the Danish North Sea. It is the government that owns the sub soil and gas resources and it is our responsibility to ensure that lack of coordination between producers does not lead to inappropriate over-investment. I expect the strategy proposal to provide an answer for how to approach the task.

I also look forward to gaining a better insight into how big the oil and gas potential is expected to be. After all, that is the basis for future production. It will be interesting to hear some educated estimates about whether new technology will enable recovery of a greater proportion of current oil and gas reserves. The potential is large, but that is of course assuming that we can find methods which not only function in a laboratory, but are also commercially viable. Here, too, I have great expectations of the new unit at DTU and the results of its studies.

Finally, I look forward to receiving some answers on how best to create a skilled workforce for this important sector for the next 30-40 years. Action is required to avoid a shortage of qualified workers.

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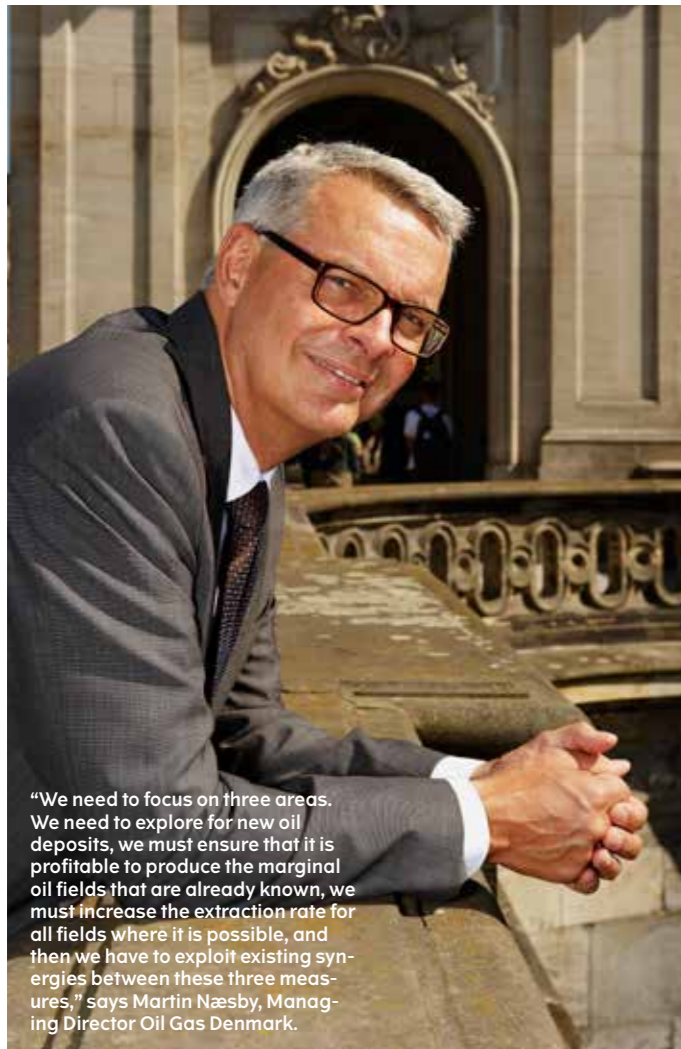
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MARTIN NÆSBY,
MANAGING DIRECTOR OF OIL GAS DENMARK

The North Sea – energy supply, tax revenues and jobs in the future

MARTIN NÆSBY, MANAGING DIRECTOR OF THE COMMON INDUSTRY ORGANIZATION OIL GAS DENMARK, DESCRIBES THE SITUATION IN THE DANISH PART OF THE NORTH SEA

“We need to focus on three areas. We need to explore for new oil deposits, we must ensure that it is profitable to produce the marginal oil fields that are already known, we must increase the extraction rate for all fields where it is possible, and then we have to exploit existing synergies between these three measures,” says Martin Næsby, Managing Director Oil Gas Denmark.

“Since 1972, nearly 4 billion barrels of Danish oil and gas have been produced with a taxable value of DKK 400 billion. We have been self-sufficient since 1995, and oil has created growth and jobs – not least at a regional level. We continue to need oil and gas as energy sources, also as a supplement to renewable energy sources, and therefore we must of course produce what we have ourselves. Taxable income, welfare, jobs and self-sufficiency are at stake. There is potential in the North Sea, and now the challenge is to ensure that it will be attractive in the future for companies to invest”. He goes on to say that although the drop in the price of oil has put the industry under pressure, the price-drop reinforced some of the trends in the Danish oil and gas industries, which were already present when the price was high.

“The very low price of oil has toughened up the reality that the Danish oil industry was already facing when oil prices were high – namely that production costs are rising and the marginal profit on a barrel of oil is falling. The remaining

deposits in the Danish part of the North Sea are both smaller in volume and involve a higher level of risk, as they are difficult to produce due to either geological or geographical conditions. Contemplated from a financial standpoint, this means higher costs and lower revenues, and therefore it can be difficult for companies to make money. At this point, that is the reason why we are not expecting new and important investments in the near future,” he says.

“When we discuss this challenge, it is because there is still significant potential in both oil and gas in the North Sea. As a nation, we must within a short period of time decide how we are going to secure this potential,” says Martin Næsby and explains that the urgency is due to the fact that the current infrastructure in the North Sea is crucial in order to be able to realize the potential in full. If the infrastructure in the North Sea is dismantled, we cannot return at a later date and retrieve the oil we did not extract, because it would be too expensive to build new platforms and add new pipelines in rela-

tion to the value that is still there in the substratum.

“In some cases the infrastructure is dated, and prolonging its lifespan will require massive investments. Some of the oil fields are becoming very mature, so that in the foreseeable future they will no longer be financially viable. These two conditions are forcing us to deal with the future of the infrastructure,” says Martin Næsby, and informs that there are, however, good and valuable synergies to be had in producing the additional resources that remain in the Danish sub soil. “We need to focus on three areas. We need to explore for new oil resources, we must ensure that it is profitable to produce the marginal oil fields that are already known, we must increase the recovery rate for all fields where it is possible, and then we have to exploit existing synergies between these three measures. The exploration and production from new fields which can piggyback on the existing infrastructure will mean that it would be worthwhile to produce older fields for a little while

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longer – and at the same time it will be possible to conduct research to increase the recovery rate, and in that way receive an even greater benefit,” he explains.

GLOBAL COMPETITION FOR BUSINESS INVESTMENT

When we already know what it takes to fulfill the potential of the North Sea – why are businesses not acting on it? Martin Næsby returns to the fact that we have reached a state of affairs where the business platform for companies has become too narrow to allow new major investments in the Danish part of the North Sea.

“Recovery of the North Sea potential requires large investments. There must be investment in the maintenance of an increasingly aging infrastructure, expanding existing oil fields, exploring for new oil fields, drilling wells and much more. The reality is that under the present conditions, companies have difficulty making this economically viable. Of course, the drop in the price of oil price has not made it any easier,” says Martin Næsby and points out that the narrow

business case in Denmark may encourage firms to move their investments elsewhere.

“In a global competition for capital, money will migrate to where it is most attractive to invest. When we contemplate the other countries surrounding the North Sea, it is evident that they are doing what they can to make conditions more attractive, precisely because they have seen investments drop. This undermines the competitiveness of Denmark, and we run the risk that companies move their investments away from Denmark. This is something that we have to deal with,” says Martin Næsby.

THE LONG TERM NORTH SEA STRATEGY

The Danish Energy Agency has estimated that Denmark could be self-sufficient with oil up to 2021 and with gas up to 2023. An effort to fulfill the potential of the North Sea may extend this period. For this and other reasons, the previous government initiated work to formulate a long-term strategy for the North Sea.

“On the one hand, the mandate for this strategy work is to get a more accu-

rate picture of the size of the potential, and on the other to get some clarity about existing barriers against realizing the potential,” says Martin Næsby.

“We have an expectation that the strategy work will clarify the challenges that are facing the industry. The most important thing for us is that it will be clear to the government that the industry is very challenged going forward,” says the industry manager.

“It is not just companies, but to a large degree also the state that will be the winner if the potential is realized. It is about future energy supplies, earning hard currency, a large tax contribution and not least jobs and regional growth. It is my hope and belief that we can continue our constructive dialog in order to ensure terms for the industry which can provide some good solutions,” he says, and concludes by commending the constructive cooperation with both the previous and the current government concerning the problems the industry is facing.



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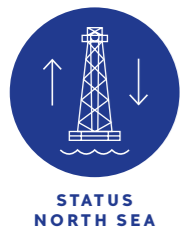
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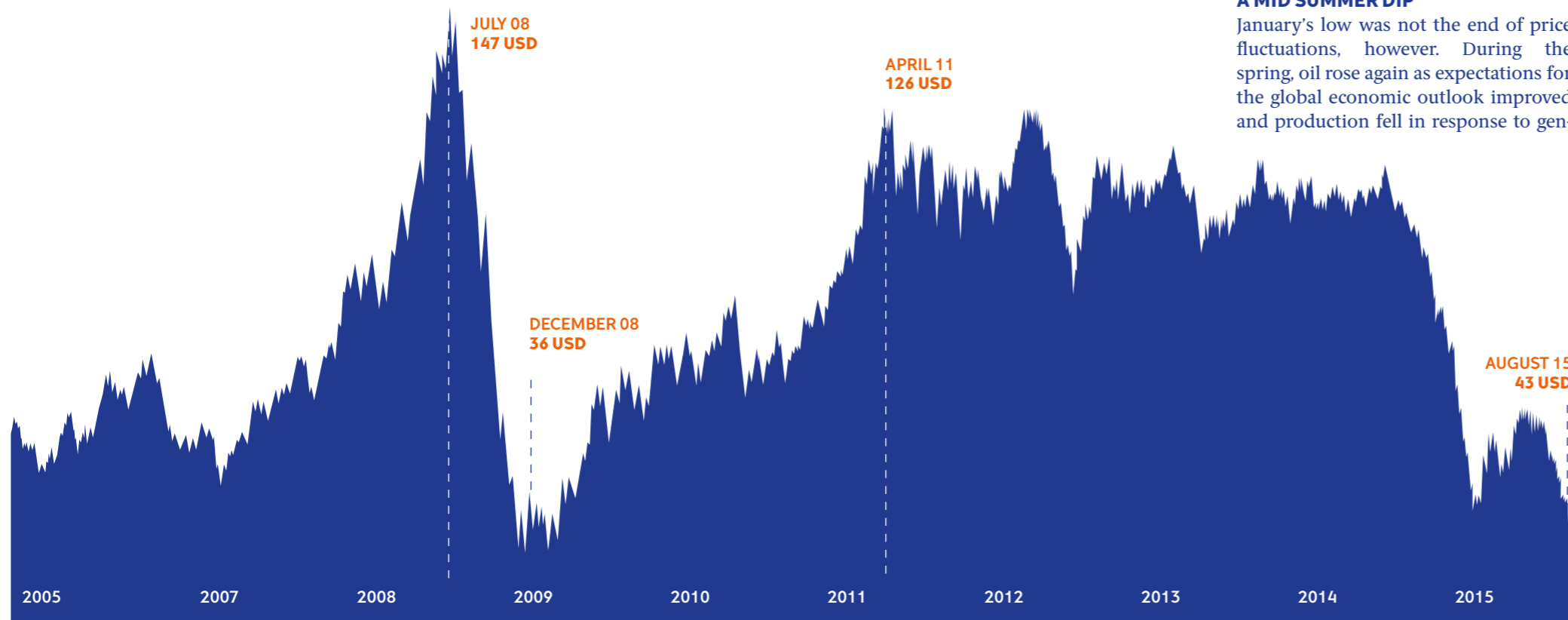
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ANALYST:

MARKET FORCES STEER OIL PRICE ROLLERCOASTER

FOLLOWING THE PRICE OF OIL IS LIKE TAKING A RIDE ON A ROLLERCOASTER. A RELATIVELY FLAT STRETCH FROM 2011 TO SUMMER 2014 ENDED WHEN IN AUTUMN THAT YEAR THE PRICE DROPPED PRECIPITOUSLY TO UNEXPECTED DEPTHS. FROM A \$115 PER BARREL PEAK IN JUNE 2014, IT FELL BY ALMOST 60% TO JUST UNDER \$47 IN JANUARY 2015



What forces were in play for oil prices to change so dramatically over such a short period of time? Jens Nærvig Pedersen, a senior analyst at Danske Bank, follows oil price developments closely. “If we turn back the clock to just before summer 2014, the price lay between one-hundred and one-hundred-and-ten dollars. At that time it was thought that an uptick in economic growth would continue to drive up prices and that not enough oil was being produced to meet demand,” he says. That market expectation changed however, when the International Energy Agency (IEA) issued its monthly forecast on 11 August, says Nærvig Pedersen. The prognosis revealed that the US was producing more oil than forecast while economic growth in Europe and China was weaker than expected. Too much oil had been produced and prices started to fall. “By the start of November the oil price had dropped to eighty dollars and OPEC was expected to take its usual correcting action and give the market a helping hand by reducing supply. But OPEC changed strategy. It was less worried about price than market share, which was increasingly threatened by US shale oil. OPEC’s lack of action sent oil prices into freefall and in January they bottomed at 45 dollars,” says Nærvig Pedersen.

A MID SUMMER DIP
January’s low was not the end of price fluctuations, however. During the spring, oil rose again as expectations for the global economic outlook improved and production fell in response to gen-

erally low prices earlier. Brent oil rose to \$60-65. That did not last long. The rollercoaster ride continued over the summer with another drop.

According to Nærvig Pedersen, the summer dip had several causes. First, the nuclear deal with Iran opened the way for the country to push 0.5 – 1 million barrels a day onto the market in 2016, once production got going. With its very low production costs Iran can be a competitive player, even with low global prices. Next, the world’s markets began to doubt the strength of the global economic recovery. Concern spread that the US federal reserve would raise interest rates. In addition, unease about the rate of economic growth in China affected the price of both equities and commodities. Oil prices moved down in tandem with the broad financial market. How restless the market had been over the summer was seen in the final days of August when oil prices soared more than 15% in two days in reaction to declarations by both European and US central banks that they would not stand idle in the face of continued decline in financial markets.

UPPER OIL PRICE LIMIT
“But what can OPEC do?” asks Nærvig Pedersen.

“The big picture is that back when oil topped a hundred dollars, the stable high price drove a string of new discoveries in the US, Canada (tar sands), Brazil (ultra deep water) and in the Arctic. Right now the market cannot support recovery of oil at that production cost. OPEC is in a situation where as soon

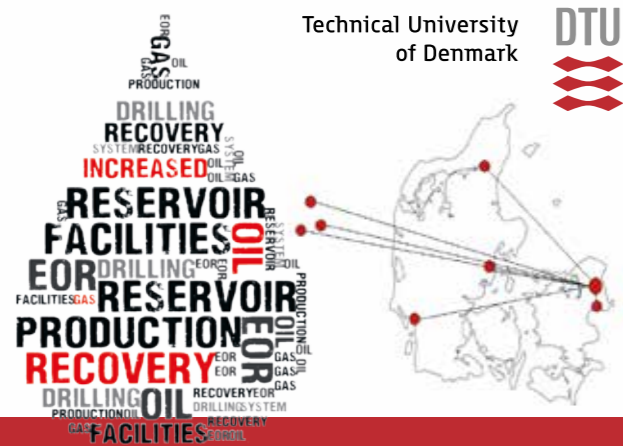
as the oil price is high enough, the taps will turn on everywhere and if Saudi Arabia wants a price war, producers will turn off the taps again,” he says. “Dynamics in the oil market are changing, which means that the price is not coming up over a hundred dollars any time soon. And major oil producing countries in OPEC are dependent on an oil price above that figure to balance their budgets,” says Nærvig Pedersen. “They have kept people happy with an accommodating fiscal policy,” he adds, referring to the dilemma faced by OPEC.

LOWER OIL PRICE LIMIT
“The general trend is that there is more oil, but it has become more expensive to extract. Only in the Middle East can oil be recovered at very low cost and that sets the limit on how far the price can fall. I do not believe it is realistic to talk about an oil price that lies permanently at around forty dollars – it’s simply too expensive to produce for that to happen,” says Nærvig Pedersen. He adds, however, that falling production costs have been observed for US shale oil. In essence, if prices are too low, supply will drop excessively and when oil is in short supply, prices will rise excessively. “Should the price rise over one-hundred dollars, we know just where to find the oil. It’s just a question of whether it pays to invest in recovery production. Plans for production at that price are back on the shelf in a cupboard and the door is currently closed. When the price nears one-hundred dollars, the plans will no doubt be brought out again,” concludes Jens Nærvig Pedersen.

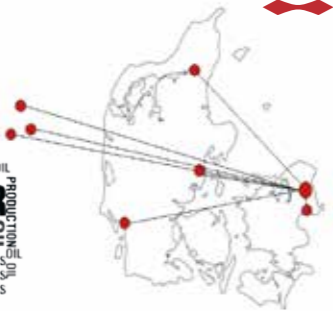
What to watch for with regard to the future price of oil



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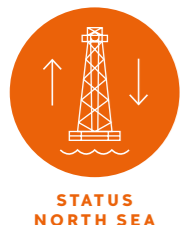
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CALL TIME OUT:

Future investments under pressure

OIL PRICE FLUCTUATIONS ARE FAMILIAR TERRITORY FOR MAERSK OIL AND DONG ENERGY, BUT EVEN SO THEY HAD NOT EXPECTED THE PRICE TO FALL AS FAST AS IT DID OVER THE PAST YEAR. WE SPOKE TO DENMARK'S TWO MAJOR INDUSTRY OPERATORS ABOUT THEIR ACTIVITIES IN THE DANISH NORTH SEA GIVEN THAT THE PRICE OF OIL HAS HALVED SINCE MID-2014

PHOTO / LARS JUST

Martin Rune Pedersen has been country manager for Maersk Oil's Danish business unit since April this year. From his office at the Port of Esbjerg he shares his view of the current situation.

"The status for us in the Danish sector of the North Sea is that we continue to see great potential for oil and gas production, but the task is technically complex, costly and requires major investment. It's important to consider that the offshore infrastructure we have today consists of more than 50 installations. Parts of the infrastructure are more than 40 years old and require a lot of maintenance costing millions of Danish crowns. The work is necessary for health and safety reasons and is essential for exploiting the maximum potential of the existing oil and gas fields."

Maersk Oil's Danish business unit has just completed drilling five test wells during 2013 to 2015.

"We are assessing the technical and commercial potential of the latest wells. The value they can potentially provide has not become less important at a time

of low oil prices," says Pedersen.

"In light of the past year's price fall we're in the process of carefully assessing our portfolio. Some of our planned investments are challenged and that is

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Martin Rune Pedersen,
country manager for Maersk Oil's
Danish business unit.

putting pressure on our future requirements for new technology and new projects to increase the recovery rate."

NO PANIC

At DONG Energy, Flemming Horn Nielsen has been country manager for the company's oil and gas activities for the past four years. His concerns reflect those held by Maersk Oil.

"At DONG Energy we don't panic about swings in oil prices – we've been through it all before. But we had not foreseen the price would dip quite so low. It puts additional focus on our costs," he says.

"When we, like others, look at where we explore and consider new projects, obviously we're looking across borders. We make investments where it makes most sense, with no distinction between Denmark, the UK and Norway," says Horn Nielsen, putting his finger on the particular challenge of oil recovery from the Danish continental shelf.

"So much more can be produced from the Danish continental shelf, but the projects are marginal. So it's about finding a profitable way to realise them. Solving that challenge has become more important still in the current investment climate," he says.

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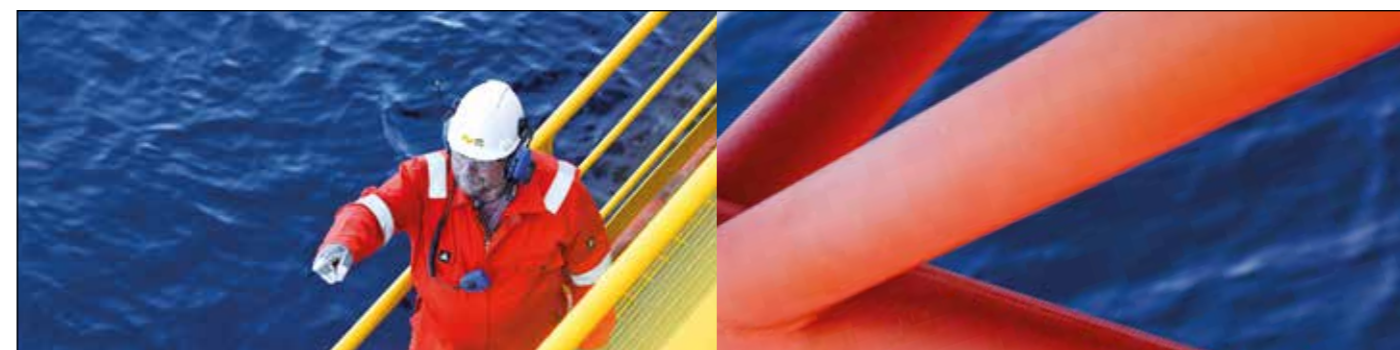
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“A lot more oil can be produced from the Danish continental shelf, but the projects are marginal. Finding a way to profitably realise the projects is a challenge that the current investment climate has only made more challenging,” says DONG Energy’s Flemming Horn Nielsen.



son we encourage companies to continually look at whether they can do more together. It’s something we’re exploring with both Hess and Maersk Oil, to see if we can cooperate further to lower our costs,” says Horn Nielsen.

EXCITING TIMES

Like the rest of the sector, DONG Energy is keeping an eye on whether a consolidation of the industry will occur through a wave of sell-offs and acquisitions.

“These are exciting times and it could be that sellers enter the market who are under pressure to dispose of something, opening up opportunities for buyers. If any of the large companies buy or sell assets, smaller companies feel a ripple-effect. Right now everyone is sitting back and watching to see if something is going to happen soon. We’re not watching any more than before, but it’s fascinating to see whether other oil companies will further optimise their portfolios – which we’re also interested in,” says Horn Nielsen. He stresses that DONG Energy is always on the lookout for opportunities to buy or sell assets.

good economic foundation for the activities, we will continue to have operations here,” he says.

Advancing the technology and gaining a deeper seismic understanding of the sub soil conditions – including looking at what new suppliers have to offer – are areas of focus for DONG Energy. “We are, for example, very interested in decommissioning platforms. When we have a business case for production, we must also calculate what it costs to remove the equipment again. We believe the market is very underdeveloped in this area and we hope the industry and the technology can demonstrate how costs can be significantly reduced.

“We are also looking at business development costs, including implementation of projects and the associated capital costs. It’s not just technology, but also feasibility and contract structures, where we as an industry still have a great deal to learn,” says Horn Nielsen.

INVESTMENT PERSPECTIVES

Which investments Maersk Oil makes in future production are influenced by the price of oil today, continues Pedersen.

“The oil we are working to recover belongs to the Danish people. Both we and Denmark have an interest in improving the rate of recovery because it safeguards jobs and adds to tax revenues which benefit all Danes. In the past decade alone these amounted to more than 220 billion Danish crowns,” says Pedersen, who adds:

“It is becoming more and more complex because the big fields have already been found. This is the general situation in the North Sea, though with the exception of Norway where large discoveries are still being made. We have also made a large gas discovery in the British sector, but generally the discoveries now are smaller and more marginal over the whole of the North Sea. For this reason it

WAIT AND SEE

“As for exploration, all the oil companies – including DONG Energy – will wait and see whether the situation improves. Going forward, we are participating in the Danish government’s seventh round of project licensing and we’re working hard to get value out of the new wells in the Siri field and on expansion of the Solsort [Blackbird] discovery, while we continue to expand the important Hejre field. Every time we evaluate a project we make a business case. A significantly lower oil price means some projects will no longer meet our economic criteria. This has consequences for how we prioritise our investments,” says Horn Nielsen.

“Whether it pays to invest in the North

Sea right now depends on the assets held. When the price of oil falls, roughly speaking that requires robust reserves and/or high productivity. So what might have been attractive a year ago, may not look so attractive today. We haven’t felt any big negative impact at DONG Energy as yet, but the situation can present challenges for individual licenses. Caution is recommended, there’s no doubt about that,” he says.

FOCUS ON SPENDING

The decline in oil price has sharpened the global industry’s focus on costs and the Danish oil and gas companies are no exception, says Maersk Oil’s Pedersen.

“We’ve seen a big increase in the indus-

try’s level of activity and costs in recent years, made possible by a price of 110 dollars a barrel. Today we are sharply focused on reducing spending. It can be things like the rental rates for drilling rigs and the capital costs of development and investment in new projects. Prices are very much market-driven in terms of both raw materials and production costs and we as a company must be responsive,” he explains and adds:

“It’s the same story for many of our sub suppliers. We are in constant contact with them about how we can together work to bring down the level of spending. Is there an aspect of our cooperation that we can make smarter to cut costs?”

The story is similar at DONG Ener-

“As for exploration, all the oil companies – including DONG Energy – will wait and see whether the situation improves”

Flemming Horn Nielsen, country manager DONG Energy E&P

gy. Low oil prices have provided new impetus to review supplier contracts, technical standards, and organisational efficiency and provided an incentive for exploring the potential for more industry collaboration.

“We would like to see the industry cooperate even more closely. For this rea-

DONG Energy will be in Denmark for both the medium term and the long term, assures Horn Nielsen “We’ll be here because we belong here. We have a good understanding of the market and the sub soil conditions and we have a skilled and well-established operational organisation. So as long as there is a



is important to maintain the existing infrastructure, make investments and create the right conditions to also make recent discoveries commercial to exploit. Once dismantling of the infrastructure begins, it will become harder to defend the exploitation of the smaller discoveries," says Pedersen.

CONSOLIDATION

Acquisition opportunities are keenly watched for at Maersk Oil and the low oil price can provide added impetus, continues Pedersen.

"We're continually looking at market opportunities for acquisitions and the North Sea is an attractive market for us. We're also looking at what has been done in the British North Sea to stimulate future investments. They have reduced tax rates and provided tax credits for North Sea investments to make them more attractive. If new investments can be stimulated by favourable market conditions the result is tax revenues, more activity and jobs," concludes Pedersen.

"The oil we are working to recover belongs to the Danish people. Both we and Denmark have an interest in improving the rate of recovery"

Martin Rune Pedersen, country manager for Maersk Oil's Danish Business Unit.



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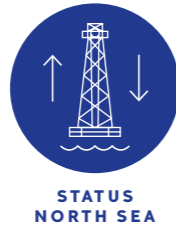
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Increasing demand will bring the oil price up again

“When it rains on the priest, drops get shed onto the clergy.” The old Scandinavian saying is an apt metaphor for the trickle-down effect that the oil industry’s suppliers are feeling from the impact of low oil prices on the big North Sea operators. The drops are falling ever more slowly on companies providing services to Maersk, DONG Energy and Hess. Staff have been laid off by several sub-suppliers and there are fears that skilled professionals will leave the industry to seek new jobs, with the risk they will no longer be available when the price rises again.

FOTO / LARS JUST

How hard companies are hit by the downturn depends on their location in the food chain. Those closely associated with production are not suffering as much as companies that work on project development of new fields, a trend noted by John Sørensen, managing director of Ramboll Oil & Gas.

“These are new times and our sense is that many projects will not be started as intended a year ago. They are being deferred, revaluated or simply put on hold and the level of activity is generally lower than it was eighteen to twenty-four months ago. It has an effect on our daily activities as the competition has been fierce and we’re all fighting for slices of a smaller pie. It’s not specific to the Danish

sector of the North Sea. It applies worldwide,” he says.

Ramboll Oil & Gas works with a wide variety of tasks in the industry, but is primarily active in development of new fields, upgrading existing fields, and transporting oil and gas from offshore fields to onshore terminals.

“We are the first link in the supply chain and probably felt the slow-down before others, but now I think everyone is affected. When it comes to new projects, we’re speeding along at a slower pace and of course operators are looking to reduce their level of spending,” says Sørensen.

He believes the downturn will come to an end, no matter what, when the market

rebalances. “Demand for oil is there and is growing as the global economy grows and as more and more people join the middle classes, raising their consumption. Meantime, production is naturally declining in the existing oil fields as they become depleted. A market rebalancing is on the way,” says Sørensen. In his experience, periods of low activity historically last from one to two-and-a-half years before the wheels start turning again.

COMPANIES RESPOND TO OIL PRICE MOVEMENTS

“We do respond in the short-term, but we try to do so as little as possible, given that we have just one item of value in our company — and that is our employees. We don’t have a physical product. We deliver staff time and ideas and time cannot be stored,” says Sørensen, who explains that Ramboll Oil & Gas has had four dials to tweak and all four have been in use.

Reduced earnings. When Ramboll cannot sell hours the time not consumed goes to waste. That loss has to be absorbed internally and is reflected in poorer financial performance.

Employee layoffs. Ramboll tries to minimise layoffs to avoid selling off the company’s “crown jewels.”

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"I expect to adjust to a 20% reduction in activities and workforce for a year or two yet. At that point the market could pick up speed again as oil prices rebound," says Henrik Hansen managing director at Q-Star Energy.

Lower prices. To win a larger share of a smaller market and keep staff in work, Ramboll endeavours to be increasingly cost competitive by becoming more efficient.

Save costs. To justify retaining more employees in-house spending must be reduced elsewhere.

"We have been compelled to lower prices, which means we have gone from being a normal sound business to not being one at the moment. We've got to the point where it costs us to do our work, which cannot continue in the long term. We have to find a solution," says Sørensen.

Ramboll has attempted to place staff in other parts of the business, but that approach has not been possible on a large scale due to the specialised nature of much of the work, which is a problem.

"As an industry we have fought for years to attract skilled labour. With the current low levels of activity, some companies downscale, which unfortunately means that some good, talented employees see the situation as too uncertain to risk their entire future on this industry and look elsewhere instead. It's most unfortunate for our industry and could give us problems long term. I think everyone is aware of it, but we have to ignore the problem because we must do something in the short term to minimise the economic risk in the current situation," says Sørensen.

"We are of course evaluating the opportunities for consolidation as well. Traditionally, it's been very expensive to acquire companies in our part of the food chain if their earnings are robust. At the moment it's cheaper, because companies aren't making a good profit, if any at all. Then again, it's also more risky to purchase. It's a constant evaluation of whether an asset is interesting for us seen in relation to other parts of the Ramboll Group," says Sørensen.

"In the short term, Ramboll is waiting for the market to rebalance. We'll get through this, but it's hard to estimate how much longer it will continue. I'm keeping an eye on the oil price, because that's what the oil companies respond to."

Q-STAR ENERGY: THE OIL IS OUT THERE

Henrik Hansen is managing director at Q-Star Energy, which provides personnel from a wide range of professions to the oil and gas industry. After peaking at a workforce of 900 in 2014, Q-Star was down to 600 staff just before summer this year.

"I expect to adjust to a 20% reduction in activities and workforce for a year or two yet. At that point the market could pick up speed again as oil prices rebound. Oil will still be needed for aircraft, cars and raw materials like plastic," says Hansen, adding that the time perspective is important.

"We can get people back again. We're accustomed to long periods of frantic work for seven or eight months, followed by three to four months off. But if it goes on for too long, people disappear out of the industry. They need a liveli-



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“When many companies are forced to adapt and make cuts, we risk losing talented people who look to other industries and they can be difficult to get back in the business again,” says Karsten Krogsoe, Sector Manager at Caverion Oil & Gas.

hood,” says Hansen. For this reason he sees a challenge in keeping people in the industry. The low price of oil combined with the structure of the Danish market will mean less exploration in the Danish North Sea, according to Hansen. Although the oil is out there, he does not see much exploration and production over the next few years.

In relation to ongoing recovery from existing fields, Q-Star is more comfortable. It helps operators maintain the entire oil and gas production infrastructure, including pipelines.

“There is a lot to do to maintain the Danish infrastructure. Many of the platforms out there are from 1971/72/73, and there’s a lot of maintenance involved and here we’re happy,” says Hansen.

Even so, the increased focus on costs has hit supplier prices, he adds.

CAVERION: HARDER TO RECRUIT

Engineering contractor Caverion, which has 130 employees in a mix of office, engineering and technician roles, has not been hit as hard by the oil price downturn — yet. Sector Manager at Caverion Oil & Gas, Karsten Krogsoe, has an office with a view over the harbour in Esbjerg

and although the weather is set fine for now he can make out some dark clouds on the North Sea horizon.

“We haven’t been hit so hard by the oil price, because we work mainly within maintenance, an area that experience has shown to be expensive to make savings in,” says Krogsoe.

Like other sub-suppliers, however, he is concerned that the threat of cuts will cause good people to leave the industry, which exacerbates an already difficult recruitment situation.

“The challenge is not to lose those with the needed skills during the downturn

Karsten Krogsoe, Sector Manager at Caverion Oil & Gas

“When many companies are forced to adapt and make cuts, we risk losing talented people who look to other industries and they can be difficult to get back in the business again. It could get quite bad, as we already have a hard enough time attracting people as it is,” notes Krogsoe, who adds that the average age of North Sea workers is relatively high.

Many of them could be expected to pull out over the next five to ten years. Caverion is hoping to make it through the current period of low oil prices without making staff reductions.

“Fortunately, we are part of a larger corporation that also has many other activities. It provides us with internal flexibility,” he says. How hard a company feels the pressured in a time of low oil prices depends on where it lies in the supply chain in relation to exploration and production, according to Krogsoe.

It is the consultants, designers and engineers and those closely involved in project development that are most affected right now. When activities ramp up in the North Sea once more, they will be the first to get going again. The challenge is not to lose those with the needed skills during the downturn.

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A drone is an extra pair of eyes unconstrained by gravity and the normal limits of difficult-to-reach areas in complex plants. Drones can play a big role in minimising the time people spend in high risk areas.



NORTH SEA DRONE ZONE

Maersk Oil is using aerial drones as an integral part of its inspection program in the North Sea. The results are promising; the high-flying helpers are cheaper, more efficient and they increase safety offshore.

Quirky ideas from online retailers and restaurants, which have tested speedy delivery of freshly baked pizzas, have dominated headlines around the civilian use of drones, but as the technology has matured, a global fleet of unmanned aircraft has made its way into the oil and gas industry.

"Drones are one of this decade's mega trends, and with the results we have achieved so far in our operations in Den-

mark and the UK, I am convinced that the use of drones will be an integrated part of the oil and gas industry," says Lead Production Engineer in Corporate Technology and Innovations, Martin Kaster Agerbæk.

BETTER USE OF RESOURCES

Earlier this year the Danish Business Unit carried out a drone inspection of the flare tips on the seven biggest manned platforms. Previously, inspec-

tions of flare tips have been undertaken from a full-scale helicopter with a photographer on-board.

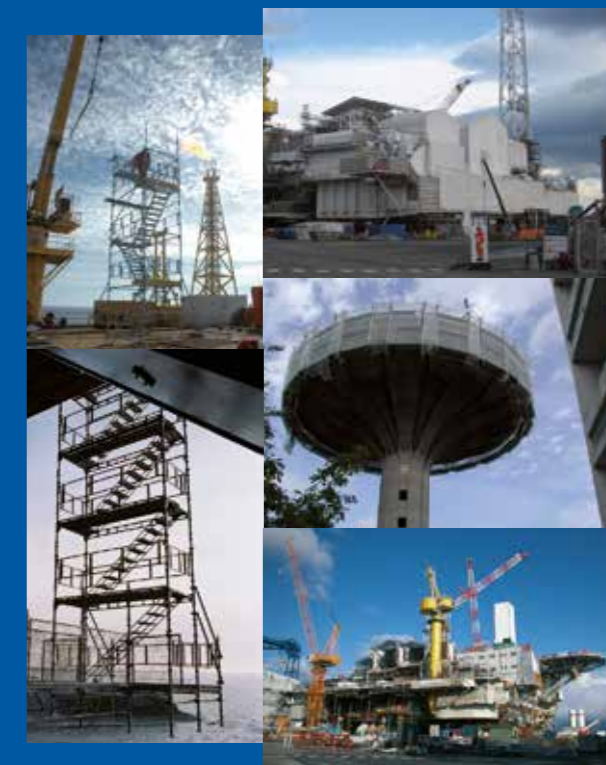
"Usually we need to stay a longer distance away with deterioration of image quality as a result. The drone allows us to get close to the flare tip even with the flare up. Thereby we get better information to determine our structural and process integrity," says Maintenance Lead in DBU, Troels Føgh Sørensen.

Improved data and thereby the quality of assessment is only one of many benefits. Using Drones instead of helicopters is also cost effective and it's a way of shifting resources, Troels explains:

"To use a Drone for inspection is less than half the price of an inspection by helicopter, and at the same time we are

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The only human involvement when a drone is used is the pilot and inspector standing on the deck. The pilot can control the drone via a joy stick and the inspector can get live footage from a digital camera on the drone and direct the pilot to fly to inspect specific areas in details.

able to free up bed spaces during inspection, and instead use them for other activities on the installation.”

IMPROVED SAFETY

A drone is an extra pair of eyes unconstrained by gravity and the normal limits of difficult-to-reach areas in complex plants. Drones can play a big role in minimising the time people spend in high risk areas.

“Drones can easily get access to areas where it is difficult for people to work. The drones can for example fly under the platforms and the bridges that connect the platforms. This way we can avoid having people strapped in ropes in the high risk environment,” says Andreas Ulrich Koch, Piping & Vessels Engineer in Maersk Oil’s Danish Business Unit.

The only human involvement when a drone is used is the pilot and inspector standing on the deck. The pilot can control the drone via a joy stick and the inspector can get live footage from a digital camera on the drone and direct the pilot to fly to inspect specific areas in details.

By using drones for inspection, Maersk Oil can also avoid shutting down production when it is inspecting its flares, and it thereby improved the operations effi-

ciency and keep the production running.

FUTURE POTENTIAL

The future potential for the use of drones in offshore operations are huge when it comes to inspection. However, a lot of manual work will still be needed for the maintenance work.

“For now, drones can only take photographs and video to detect where further maintenance work is needed. We still need people to do the actual work offshore,” says Koch.

But the future might bring drones in non-business related activities. When asked if our offshore colleagues can look forward to getting pizza deliveries by drones in the North Sea, Martin Kaster Agerbæk laughs and says;

“You never know. Drone technology evolves very fast. I do see a lot of potential for future use e.g. non-destructive testing and surveying onshore”.

DRONES HAVE BEEN USED FOR INSPECTION OF:

- Flare tip & flare tower
- Top/side views of installation
- Dropped object surveys
- GVI of structures
- Cable/Pipe run identification
- Side shell inspection above water
- Thermography
- Tank inspection

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DONG ENERGY INVESTS BILLIONS IN HEJRE

The Hejre field, which lies close to the Danish-Norwegian maritime border, is one of the largest investments to be made in the Danish North Sea in recent times. DONG Energy and Bayerngas are investing over a billion euro in the field, which is expected to produce 15 million cubic metres of oil and 10 billion cubic metres of gas over its lifetime. Hejre is a so-called HPHT field, where oil and gas are found at a depth of five to six kilometres with a pressure in excess of 1000 bar and temperature of 160 degrees centigrade. Although it is the first HPHT field in Denmark, the technology to be used has already been deployed in both the British and Norwegian areas of the North Sea. We talked to three employees at DONG Energy working to bring the Hejre field online.



MARTIN OLLDAG BAY
Professional qualification:
Process Engineer
Employment: Senior Project Engineer at DONG Energy, stationed at Okpo, South Korea.

What does your job entail?

I have been involved in all phases of the Hejre project. When the focus was mostly on engineering, I was stationed in Paris before moving to South Korea to co-ordinate an office start-up where we were three or four people in early 2013 and are now 130. We had to deal with everything from acquiring work clothing to designing the office and implementing all of DONG Energy's procedures, from writing reports to making sure company management are aware of any issues. Right now I work as an engineer.

Why did you choose this profession?

When I was studying mechanical engineering in Esbjerg I happened to hear that the most difficult course they offered was oil and gas. It had the highest drop-out rate but also the highest earnings potential on completion. So I swapped to that course and though it was uphill in the beginning, seven years ago I was able to start as a consultant for DONG Energy.

What are the challenges in your job?

My challenge has been that we are 130 employ-

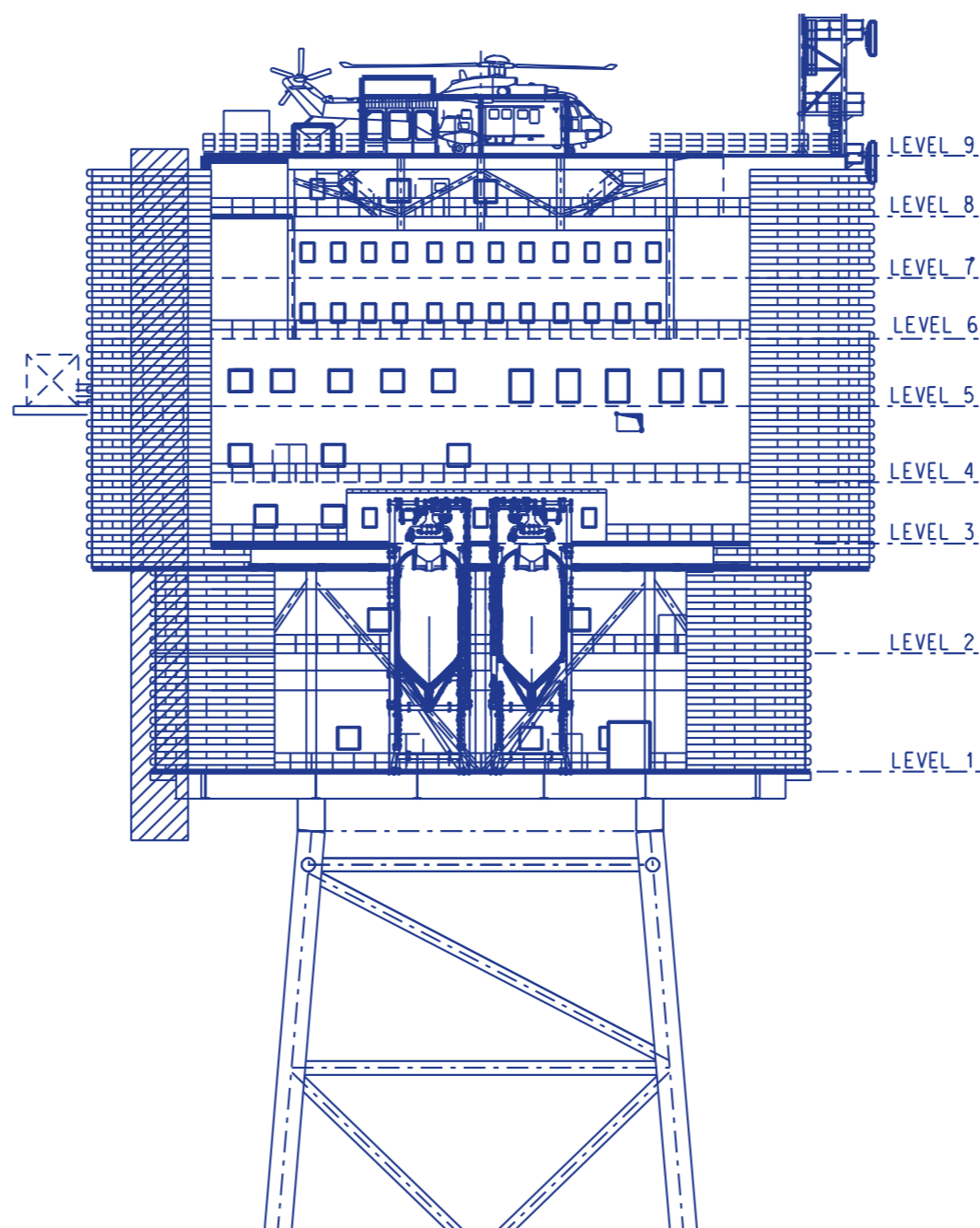
ees from 18 or 19 different countries who for the most part have never worked together before and have diverse backgrounds. We need to pull together towards one goal and that would be hard enough even if we were all from Denmark. It's incredibly exciting, when you can't predict what's going to happen through the course of a day. You develop a strong attachment to a project when you are so close to it. It feels like you've left your old life and been married to a project for four to five years. All your friends over here are from the project - it's very intense.

Would you recommend joining the oil and gas industry to others?

Yes, absolutely. It is one of the most extreme industries you can find. In the Hejre project we are working with pressure above 1000 bar and liquid substances with temperatures over 160 degrees. It's almost like building a rocket ship. You must have engineering skills and be a good team player. The project is too complex for one person to keep on top of. One of the things I think is really cool about the oil industry is that you can travel the world and if that's what you want to do then the oil industry is one of the best industries to be in.

How do you see your future?

The plan is to work offshore and be a part of getting a platform going. I really want to be out there when the valves are opened. In that way I'll have followed the project from start to finish. No doubt I'll soon feel the pull to go abroad again as I want to work on major projects like this one. My experience can also be used in other industries.



LASSE E. ABILDGAARD CHRISTENSEN
Professional qualification:
MSc Statistical Modelling
Employment: Risk and Safety Engineer at Ramboll Oil & Gas, Ørestad

What does your job entail?

I am employed as a senior engineer in Ramboll's department for risk and safety. My job is to prepare various kinds of risk assessments. A central part of my job is to recommend initiatives that either completely eliminate - or at least reduce - the risks that we have identified. Therefore my analyses are often done while the platform is still on the drawing board. This was also the case with Hejre, for which Ramboll has resolved a number

of challenges in recent years. As part of the design stage of Hejre's deck and flare tower, I contributed to a number of key risk analyses.

Why did you choose this profession?

It was actually by chance that I ended up in the oil and gas industry, but today I feel privileged to be in an industry where safety comes first and foremost on the daily agenda and where I really can use my analytical skills.

What are the challenges in your job?

A number of the risk assessments and analyses I complete require that I involve colleagues from other disciplines. It provides great insight but also a huge amount of information to keep track of. Right now my department is assisting DONG with Hejre's security and safety report (SSR), which must be updated in connection with installation of the deck. The report must demonstrate that all associated risks are identified when the

drilling rig Maersk Resolve and the temporary accommodation unit, Seafox 5, dock at Hejre during installation.

Would you recommend joining the oil and gas industry to others?

Definitely. A load of different skills are required that might not be immediately associated with oil and gas production. For example, as a consultant specialising in risk and safety it is my knowledge of both statistics and programming that come into play.

How do you see your future?

My job is extremely varied and I'm sure that will continue, given that this industry is constantly evolving.



PETER BALSLEV
Professional qualification:
Civil Engineering
Employment: Well Delivery Manager for Hejre

What does your job entail?

I joined DONG Energy September 1, 2014 as Well Delivery Manager for the Hejre project, which is the first of its kind in the Danish North Sea. I am responsible for planning the offshore drilling of the oil wells and for making sure it's done safely, on time and on budget.

Why did you choose this profession?

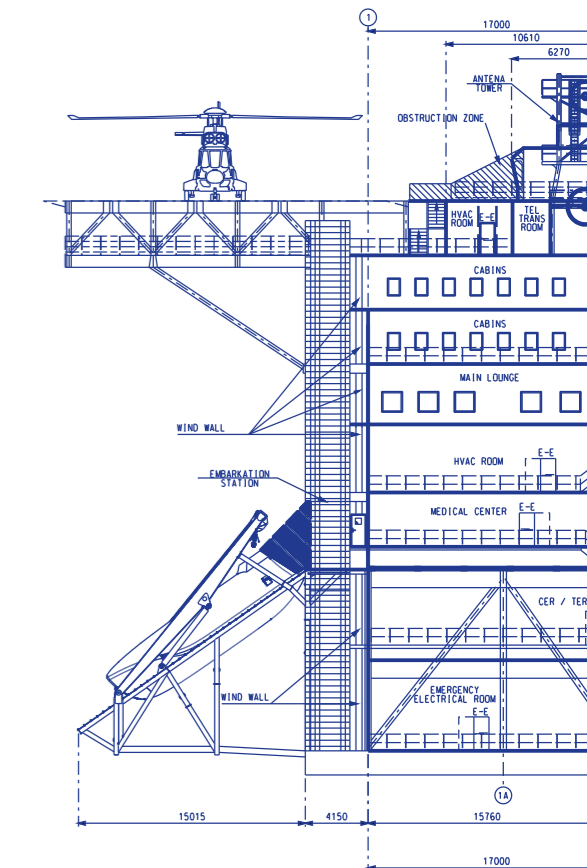
When I graduated from the Danish Technical University as a civil engineer, I applied for a job as a well-site engineer in the North Sea, with regular transport via helicopter and the possibility of being stationed abroad (the Middle East). I simply couldn't imagine anything more exciting. I got the job and have never regretted my choice. I've had many adventures abroad and at home since I started back in 1996.

What are the challenges in your job?

The Hejre project is very challenging and there are many important decisions to be made - sometimes even in the middle of the night if a problem arises. Because of the size of Hejre there are many stakeholders who need to be kept involved and satisfied with our progress. The HPHT well is very technically demanding and makes great demands of both the equipment and the quality requirements so they can cope with the high pressure and temperatures underground (over 1000 bar and about 160 degrees). It can be a challenge to get everybody pulling in the same direction at the same time in order to maintain our momentum, both offshore and onshore.

Would you recommend joining the oil and gas industry to others?

Yes, definitely. If you have a sense of adventure, the oil industry can offer plenty of adventurous opportunities and exciting work tasks, often in an international environment. The age of easy oil has passed, opening up a future that will be ever more complex and require advanced technical solutions to both locate and recover oil and gas



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THE NORTH SEA:

TOP CONTRIBUTOR TO THE DANISH ECONOMY

Production of oil and gas from the North Sea has been of significant benefit to the public purse in Denmark

From 1972, when the flow of Danish oil and gas first started, through to 2013, a total of DKK 383 billion (€51.34 billion) has swelled the national state coffers. Though North Sea revenues have declined since 2008, the state still earned DKK 22.1 billion (€2.96 billion) in 2013, a sum so large it could have covered the entire cost of the 18 kilometre bridge that spans the Great Belt between the west and east of Denmark.

Although production from the Danish continental shelf has peaked, great po-

tential remains and revenue will continue at a significant volume long into the future.

But further development of the North Sea resource stands at a crossroads. Whether or not the sub soil resources will be fully utilised depends on which road is taken.

PROVIDING TO THE WELFARE STATE

"If we look all the way back to before the start of the oil adventure, we have gone from zero contribution from the North Sea to a revenue peak in the first decade of the century amounting to thirty to forty billion crowns annually. Earnings for the Danish economy have been significant," says Jens Hauch, vice president of Kraka, an independent think tank with a stated mission to work towards securing Denmark's welfare state.

While in Norway oil revenues have

been invested in a bespoke sovereign fund, in Denmark they have flowed straight to the public purse.

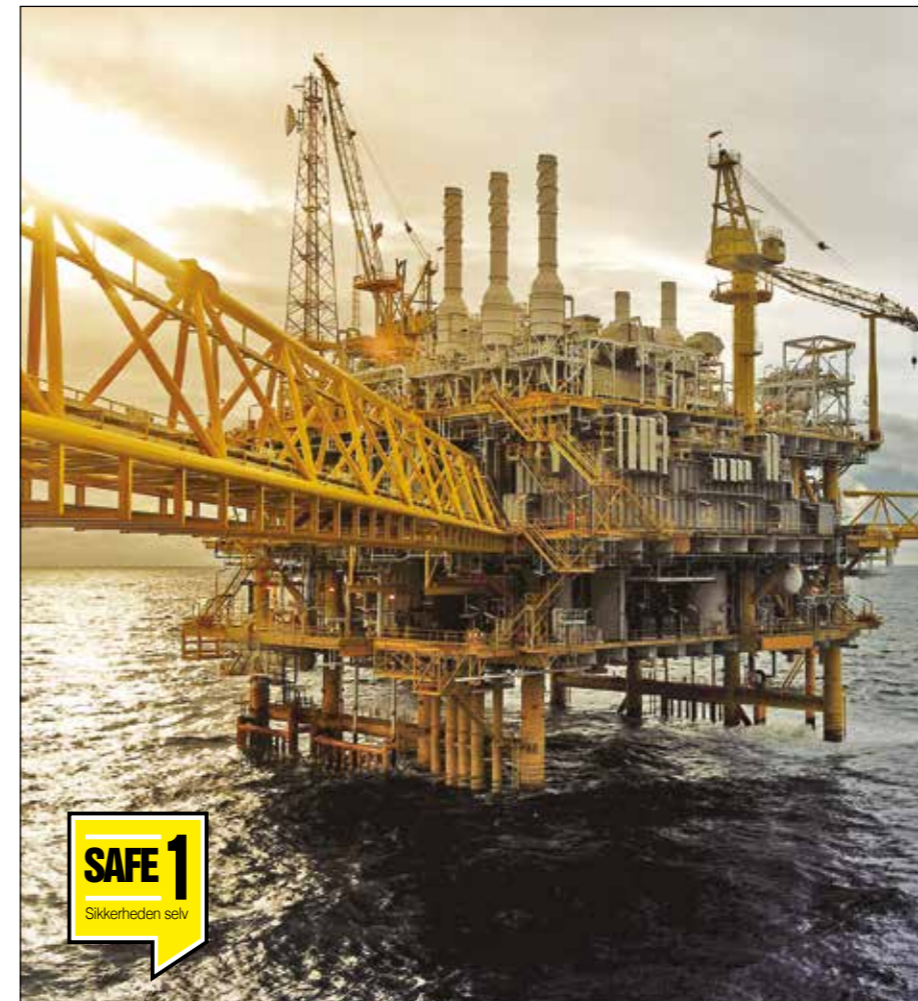
"For the Norwegians, it was good idea to set these funds up. If this had not been done and the revenues instead went to government spending, there would have been an insane amount of growth in activities. But when the Danish revenues from the North Sea have gone into common public consumption, it's difficult to point to something specific that the money has gone towards," says Hauch.

"We need players to produce up the oil" Looking forward, Hauch identifies two critical factors. First, while it is crystal clear that revenues from the North Sea will decline, Denmark must ensure it

DKK 383 billion

– STATE REVENUE TO DATE FROM THE NORTH SEA

makes the most out of the remaining reserves for society as a whole. "We must first accept that in future there is simply less and less oil out there and we have to expect a decline in production. We must



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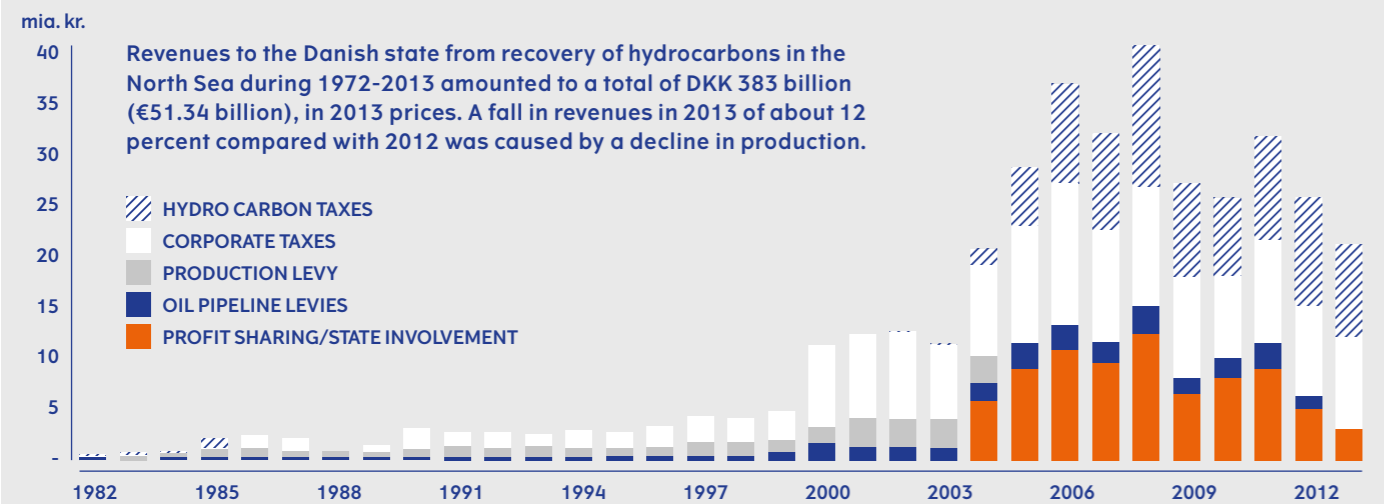
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Danish state reaps over €50 billion from North Sea



therefore adapt our economy so that in the long term, it's not dependent on income from the North Sea," says Hauch.

"The second point is how to ensure that we get the most out of the North

DKK 50.7 billion TOTAL VALUE OF NORTH SEA PRODUCTION IN 2013

Sea? And here someone like myself, who looks at society as a whole, would say that it's in our best interest to maximize state revenues from all oil that is recovered. We need players to pump up the oil and we need to get our hands on as much of it as we can. We need to tax those players as hard as possible," he says, while not forgetting that the contribution to the public purse is de-

pendent on oil producers deciding that doing business in the Danish North Sea is worth the effort.

"We have a neutral tax system, which means that oil companies can get a reasonable return by investing in the North Sea. As economists, we have to say that's a good thing. When they can get a reasonable return, we also have to expect that they'll show up out there and that we, the people, can gain the largest slice of the pie. Then there is that unpleasant problem where it turns out that the companies don't show up," says Hauch. The risk is that the oil companies move their investments out of Denmark if higher profits can be achieved elsewhere, leaving Denmark's oil in the ground, he adds.

"If companies operate with a minimum limit for their return on investment and that keeps them out of the North Sea, then we have a problem, for the oil

will just sit there. The key problem is that once the big platforms are shut down it would never be profitable to exploit the small, marginal satellite fields," says Hauch. For this reason it is important that production is maintained, he continues. It would be major cause of concern if future licences for new exploration in the North Sea did not trigger new production.

"The taxation issue is a little ambivalent. From the perspective of an economist, there ought to be enough bait for the oil companies, but if they don't come, then we have to accept that the bait is not good enough. In dialogue with the

21.5% — THE OIL AND GAS SECTOR'S SHARE OF DENMARK'S TOTAL CORPORATE TAX REVENUE IN 2012

oil and gas sector an evaluation must be made about whether the incentives are sufficient to lead to oil extraction out there" says Hauch. "It's a reality we have to deal with – even if it's inconvenient."

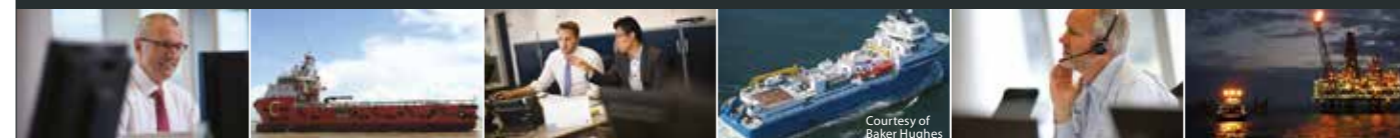
Hauch says it fair enough that the state intends to secure as large a share of North Sea value as possible. But if high taxes reduce extraction activity, revenues will fall below optimal levels and taxes would have to be lower. It's the only option, according to Hauch.

"It could also be that the state's share of the assets out there needs to be larger or the state needs to assume a greater share of the risk in the business of oil extraction," concludes Hauch.



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"Vi skal ikke kun lave tung forskning, men også stimulere et økosystem af innovative initiativer som peger direkte mod anvendelse," siger Bo Cerup-Simonsen, der er direktør for det nye "Center for olie og gas - DTU".

NEW RESEARCH CENTRE AIMS TO ENABLE MORE OIL AND GAS FROM NORTH SEA

“Our highest hope is to play a part in developing new solutions that are actively exploited to increase oil and gas production – that’s the ultimate criteria for success.”

The speaker is Bo Cerup-Simonsen, director of the Centre for Oil and Gas — DTU. The research centre at the Technical University of Denmark (DTU) and has been in operation since September 2014 as the first of its kind in Denmark.

“One of the questions we have to answer is how research can best contribute to increased oil and gas production. It’s an interesting exercise for the academic world, which on the one hand strives for academic excellence and on the other hand must deliver a result that can be put to commercial use. Not only must we conduct pure research, but also stimulate an ecosystem of innovate initiatives with a clear indication for direct application. It could be anything from a new mathematical analysis method for 4D seismic data, to a new platform concept,” he says, adding that effort is being devoted to development of a closer working relationship between opera-

tors, suppliers and the DTU Centre as a research institution.

The centre has two main objectives, says Cerup-Simonsen. First, it must attract and train experts for the oil and gas industry. Second it must undertake research that contributes to increased oil and gas production in Denmark.

“Under the categorisation of our research activities we have three research areas. One is to raise the rate of recovery from the existing known fields. The next is to open up access to marginal fields from which there is no production today because it is too expensive to get at in relation to the volume of oil we can recover. We need to help find cheaper solutions for exploiting these oil deposits. The third leg is infrastructure, where among other things we will focus on asset lifetime and operation. A reduction in the cost of maintenance and operation can prolong the economic life of a field before spending equals revenues. At the same time, we have to find ways to extend the technical lifetime,” he says.

With reference to collaboration with the Danish Underground Consortium (DUC), Cerup-Simonsen continues: “We

BROAD BASED SUPPORT

The Centre for Oil and Gas – DTU has been granted DKK 1 billion over ten years by the members of the Danish Underground Consortium (DTU): Maersk Oil, Shell, Chevron and the North Sea Fund. When fully operational the centre will employ up to 100 people and will be affiliated with research groups from the University of Copenhagen, Aarhus University, Aalborg University, and the Geological Survey of Denmark and Greenland, GEUS. The groundwork has also been done for a collaboration with suppliers to the offshore sector.

have also used our time to find out how we should work in relation to DUC, in order to generate ideas and gain access to experience and data, so that what we’re working with has relevance. DUC has been around for 40 years and has a high level of expertise and is rich in ideas. It’s important that we build on that knowledge and at the same time find a good way to collaborate that allows us to also open the way for participation by other research disciplines.”

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BO CERUP-SIMONSEN – BIOGRAPHY

→ 47 years old

Director of the Centre for Oil and Gas – DTU, Bo Cerup-Simonsen, is a civil engineer with a PhD in ship and marine-engineering from the Technical University of Denmark (DTU) and an executive MBA from Copenhagen Business School. For six years he worked in teaching and research as an assistant professor and lecturer at DTU before five years at Norske Veritas in Oslo, a global maritime technical consultancy service. He later headed up Maersk Maritime Technology for six years, among other things working on energy efficiency for both existing and new ships.

good at establishing a cooperative environment,” he says. Cerup-Simonsen hopes the centre will become a meeting place for researchers, inventors and commercial companies.

“The centre will consist of many partners. The building here at DTU will be the roof under which representatives from operators, suppliers and other institutions can gather and be a part of an exciting professional environment working on shared problems. We also want to build a bridge between industry professionals and researchers.

I believe that the links across disciplines, institutions and companies and the clear focus on application can evolve to make the centre unique. We will gain insight into technically complex problems which provide great potential for realising value on the one hand, while on the other hand we can invite the foremost researchers and most innovative companies in to look at the issues with new perspectives. It could be new calculation methods, measurement methods, materials or new chemistry. We can get totally new ideas into play. We want to be right in the middle, at the interface where application and value creation meet the research world – this is one of the most fun parts of the whole thing,” says Cerup-Simonsen.

He is wary of making any estimate about how large the tangible effect of the centre could be.

“It’s too early to be serious about how much we are going to contribute towards raising the recovery rate in the North Sea, but we are obviously ambitious. It

To create the greatest possible symbiosis between the oil and gas industry’s many disciplines, the research centre will work with large focus areas – or so-called flagship programs – and they will all be occupied with tangible projects of large potential in the North Sea. The first area of focus concerns the large chalk fields where extraction of oil and gas has long been underway, but where there is still a large untapped potential.

“Here we first need an overview of the system, from the reservoirs underground, to the wells, platforms and pipeline facilities. After that we can see how applied research can remove a barrier or a bottleneck in the system. We’ll work with the reservoirs – where is the oil and the gas, what is the geology like down there, what are the fracture systems like, how is the oil stored in the ground, and why is a deal of it left in place? Then we need to work on methods to get it out. Perhaps low-saline water can be pumped down, which has proven effective in some places. Perhaps new well technologies can help. We could also

look at the platform technology, for example how to deal with the water that is pumped down or produced with the oil. There are hundreds of ideas and we need to choose our input carefully,” says Cerup-Simonsen. As well as defining the

It would only take an increase in recovery of 0.1% to reach payback on the grant to the centre

Bo Cerup-Simonsen, director of the Centre for Oil and Gas – DTU.

first program, the centre is also building a list of possible future flagship programs, he adds.

The research is exclusively focused on conditions in the Danish North Sea. Some of the issues are global, but the chalk fields have some distinctive Danish characteristics.

“Many others are conducting research into solving general problems and it can be very resource intensive to do it better than other large research communities. For that reason we must choose our areas of research carefully and also be

would only take an increase in recovery of 0.1% to reach payback on the grant to the centre and at a minimum that should be paid off several times over,” he says.

“We want to show that research can pay off, to show that a well-functioning centre can – through learning, research, and by stimulating innovation – really contribute value to society which far exceeds the investment. Everyone should feel that they are a winner here – including the state – through greater oil and gas revenues,” says Cerup-Simonsen.

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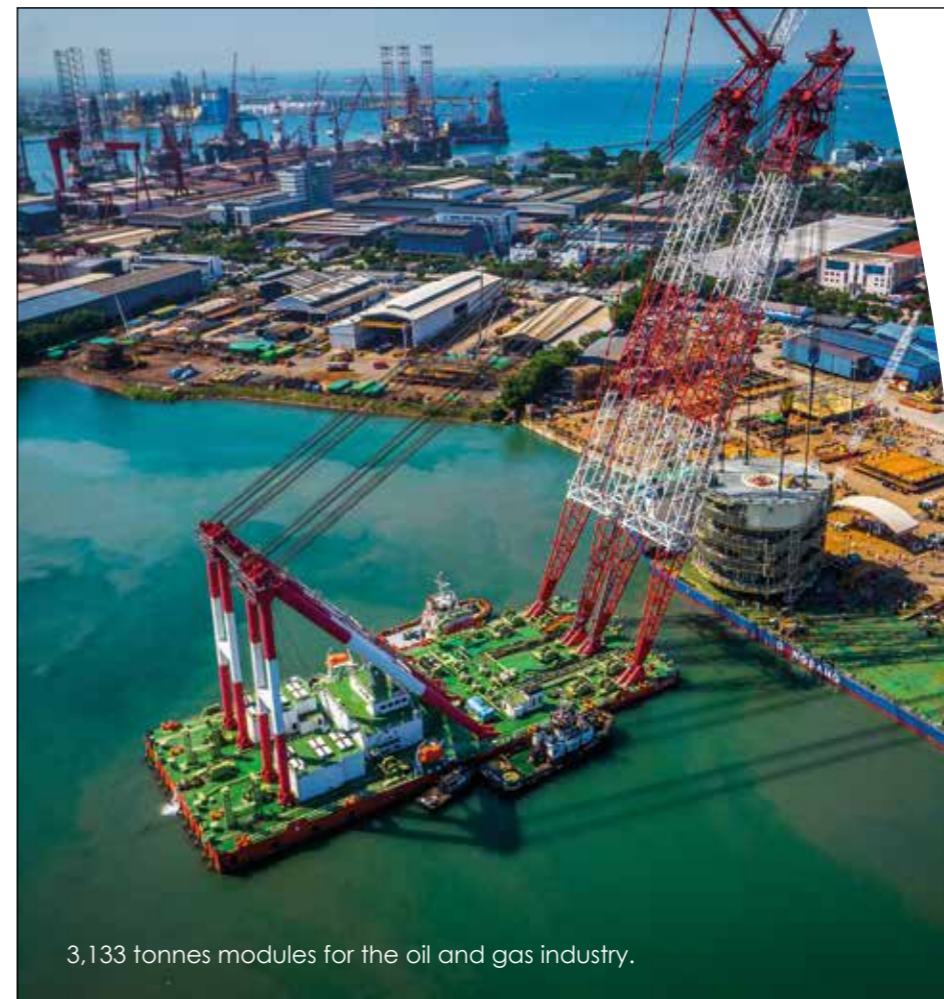
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FOTO / LARS JUST



Four men sit strapped in a cabin which until a few moments ago was swinging just above the surface. Suddenly the cabin drops underwater and flips 180 degrees. The four find themselves sitting upside down. The next moment they scramble to release seatbelts, squeeze

out of the cabin windows and search their way to the surface. Fortunately, this is an exercise and none of the four participants are in real danger. Two divers are with them inside the cabin who vigilantly watch over their charges. In the water outside, a further two divers are on red alert. The exercise,

which simulates a helicopter capsizing after a crash landing on water, is an element of the statutory safety course that the entire crew of a North Sea rig must undergo. "We try to make it so routine that the response to a helicopter going down in water is triggered automatically, but we

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Facts

- 75% of Danish wind turbine export pass through the port of Esbjerg
- 62% of Danish offshore jobs are in Esbjerg
- Esbjerg is the only Danish member of WECP (World Energy Cities Partnership)



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Based on study conducted by Quartz+Co and Copenhagen Economics (2008-2010). Note: The Danish oil and gas sector employs 15,000 people.

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hope that nobody ever has to use what they learn here," says Thomas V West, managing director at Maersk Training in Esbjerg.

"It's not natural to be strapped into a seat, lowered under water and then flipped 180 degrees. It is natural, on the other hand, for people to react powerfully to this exercise. Some need extra help before they are lowered into the water. Completing this course should make participants feel it has been a good learning experience, for a better learning experience is Maersk Training's motto."

TWO PROVIDERS OF SAFETY COURSES

Maersk Training is one of two providers of safety courses in Esbjerg, Falck Safety Services being the other. Any dream of a career offshore makes correct training unavoidable and there are strict requirements for safety certificates before anybody is sent out.

Both companies offer so-called OPITO certificates, based on a British standard which allows certificate holders to work throughout the world, not only in the North Sea.

Maersk Training in Esbjerg is a so-called survival centre, offering practical safety training to all in the oil and gas, maritime and wind industries. The centre offers a wide range of courses, ranging from half a day to ten days. The training centre has 40 permanent employees, who together with 30-40 part-time affiliated staff are responsible for the 15,000 course days that take place each year.

"Our instructors come from backgrounds that include ambulance crews, paramedics, nurses, physiotherapists and similar. Some come from platforms at sea and others from the navy. The knowledge they pass on to course participants is based on their practical experience. The permanent instructors also spend time at sea each year to keep up to speed with developments out there. Course participants benefit from instructors who can pass on practical experience and not just theoretical knowledge," says West.

The primary purpose of the survival centre is to improve safety and operational performance for companies that send their employees for training.

"Safety is central to the oil and gas industry. Nobody wants their employees to be injured or cause an environmental



"Safety is central to the oil and gas industry. Nobody wants their employees to be injured or cause an environmental catastrophe. What's more, poor safety also has economic costs," say Thomas V West, managing director at Maersk Training in Esbjerg.

catastrophe. What's more, poor safety also has economic costs," says West, who has no doubt that safety makes for good economics.

Safety is not only for workers, he adds. Immersion in a fundamental safety culture is at least as important for company management. Getting safety under the skin of everyone is vital.

Maersk Training also runs team-based simulation courses, where people from all functions take part in possible scenarios corresponding to life offshore. "It doesn't work, if one person has said A and another thinks they said B. People learn what can happen if communication is misunderstood," he says, with reference to the Macondo incident in the Gulf of Mexico, where a long list of human errors led to one of the biggest oil spills in history.

For this reason it is important to cultivate a fundamental and broad safety

culture at all levels of an organisation and to constantly have safety in focus.

Maersk Training in Esbjerg walks the talk and is itself steeped in a safety culture which is immediately visible to visitors in their receipt of a safety brochure on arrival. Routes that must be followed are clearly marked and any deviation from the rules is quickly picked up on.

"You have to think about safety everywhere. I think about it in the car and when I go into the garden. A motorcycle ride to the bakery on a Sunday morning requires donning all the necessary safety gear, for even if you are sure about your own capabilities, you never know how others will behave. It's the same in the North Sea. You can perhaps be in control of your own actions, but you can't always control nature out there and that's why you need to learn what to do in all situations," concludes West.

Focus on safety

WHY IS SAFETY GIVEN SUCH HIGH PRIORITY IN THE OIL INDUSTRY?

A production platform or drilling rig is also a hotel, an airport and a refinery. The entire edifice is surrounded by water, which makes a quick getaway difficult should circumstances require it. The location of all three in a single building would never happen on land.

A safe workplace is a basic right. Everybody should get back home in the same state of health as when they arrived at work. The oil industry's history has given us experience of events and accidents we would rather have been without. Lessons have been learnt in the offshore industry and as a result safety has a much sharper focus in an offshore worker's everyday than for a similar position at a workplace on land.

IS THE SAFETY LEVEL GENERALLY HIGH IN THE OIL INDUSTRY?

When we talk about safety in the oil industry, we're talking about everything from gas leaks to the use of a kitchen knife. Both the big and the small are reported, dealt with and action is taken to prevent it happening again in every case. There is a very high level of safety in the oil industry. Based on experience of past incidents, the mantra in the industry is "there is no accident that could not have been avoided" and "one accident is one too many."

WHAT IS OPITO?

To ensure that all those who work offshore are well prepared to deal with an emergency, they are required to complete a comprehensive basic safety course and learn about fires, sea rescue, first aid, personal safety and helicopter evacuation under water.

OPITO stands for "Offshore Petroleum Industry Training Organisation" and is a British entity that sets standards for the teaching of offshore safety courses worldwide, right down to the smallest detail. In Denmark we follow this standard to ensure that the training is always relevant, adequate and consistent. Such a standard is necessary for the safety and welfare of offshore workers in a demanding environment.



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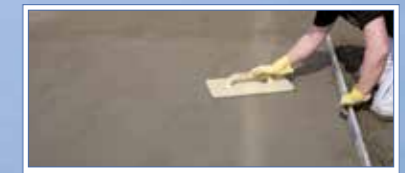


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