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DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Norwegian Actual and Forecast Natural Gas Production towards 2020

Posted by Rune Likvern on May 22, 2012 - 12:37am
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Tags: aasta hansteen, breakeven price, european buyers of norwegian natural gas, luva, martin linge, norwegian natural gas production, norwegian natural gas reserves, nsgi, ormen lange, sleipner, troll [list all tags]

In this post, I present a little about developments in actual natural gas production from the Norwegian Continental Shelf (NCS) and a forecast towards 2020. I will also talk about where gas from the NCS is reported as being sold, and give a closer look at what estimated recoverable natural gas reserves and the Reserves over Production ratio (R/P) as of end 2011 may suggest for the future production of natural gas from the NCS.

Finally, I will talk a little about the likely impact from present plans for developments of natural gas discoveries in the Norwegian Sea.

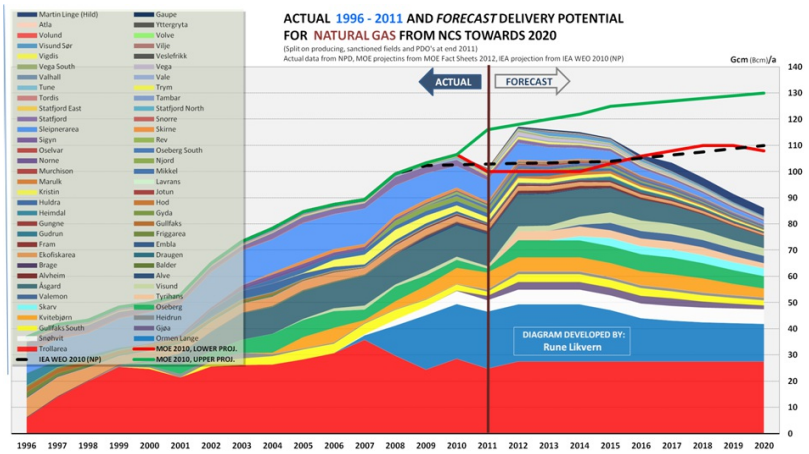

Figure 01: *The figure above shows the development of actual Norwegian gas production by field between 1996 and 2011 as reported by the Norwegian Petroleum Directorate (NPD). The figure also shows a forecast (developed by the author) on the potential of deliveries for the years 2012 to 2020. The forecast includes all producing and sanctioned fields and expected effects from developments in the R/P (Reserves divided by Production), NPD estimates for remaining recoverable reserves, facilities constraints, etc.*

The forecast does not include the effects from fields being shut down as these become unprofitable. My forecast is based upon recent data from the NPD and shows the future potential for Norwegian gas deliveries under the assumption of "normal" seasonal variations in the buyers' nominations.

The chart also includes the future expected production range from the Ministry of Petroleum and Energy (MPE) and a forecast from the IEA (International Energy Agency) towards 2020.
Norwegian gas production is now expected to reach a new high in 2012 (see also Figure 3) after a

slight decline from 2010 to 2011. For the years 2012 to 2015 Norwegian gas production is now expected to remain on what would be described as a plateau. As from 2016, Norwegian gas production is expected to decline steeply towards 2020 and beyond.

Several discoveries in the Norwegian Sea, like Aasta Hansteen (formerly Luva), Linnorm and Zidane, are now in planning for possible startups from late 2016.

Most of the content for this post was originally published in Norwegian here.

WHERE NORWEGIAN NATURAL GAS IS SOLD

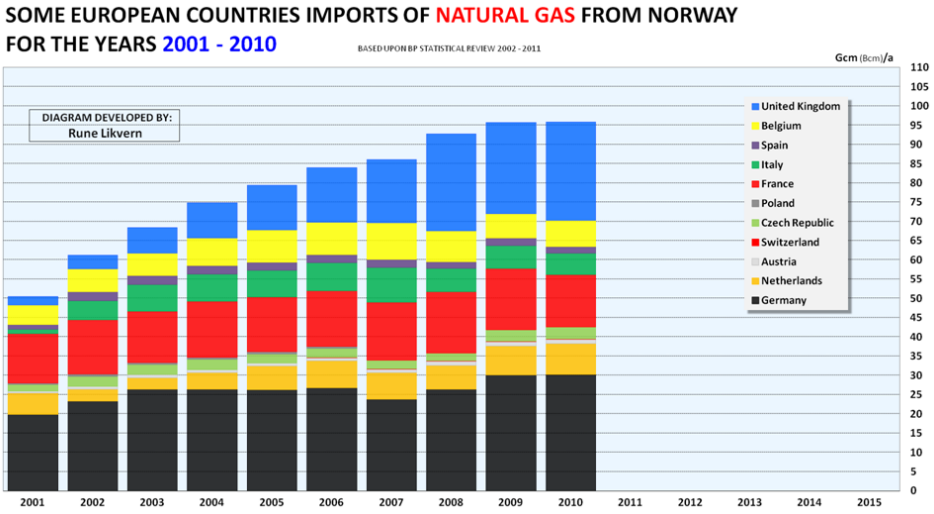

Figure 02: *The figure above shows the annual developments in Norwegian natural gas deliveries (for the years 2001 to 2010) and imported volumes by some countries.*

- Norway delivered close to 100 Bcm of natural gas in 2011 and most of its natural gas is sold and delivered to customers in Europe (that is, Continental Europe and the UK).
- As of 2011, Norway was the world's second largest exporter of natural gas after Russia.
- Around 95% of Norwegian natural gas sales are delivered by pipelines and the balance by liquefied natural gas (LNG).
- Growth in Norwegian gas sales post-2005 has primarily been to the United Kingdom, and during 2010 Norway supplied the UK with approximately 28% of all natural gas consumed in the country.

A LITTLE ON SHRINKAGE AND DOMESTIC USES

The observant reader will have noticed that sold and delivered gas volumes as shown in Figure 2 are slightly less than what the NPD has reported as produced as shown in Figure 1.

NPD reports gas volumes metered and delivered from production facilities. These volumes, which are believed to include natural gas liquids [NGL; mainly ethane (C_2H_6), propane (C_3H_8) and butane (C_4H_{10})], are all in the gaseous state at normal pressure and temperature. The natural gas which is sold is mainly methane (CH_4).

NGLs are often referred to as "bottled gas", as natural gas liquids after extraction and fractionation (as performed at Kårstø and Kollsnes), are sold and delivered under pressure in the liquid state. Extraction and fractionation of NGLs shrink the amount of gas volumes delivered

from the production facilities and thus lower sales gas volumes and their volumetric energy content.

The NGL extraction process is required to meet gas specifications from the buyers and pipeline operators.

For 2011, it is estimated that this shrinkage amounted to more than 4 billion cubic meters (Bcm), or about 4% of total reported volume of gas metered and delivered from the production facilities.

Norway uses little natural gas domestically (around 2% of annual production). It is used for power generation at the production facilities, increased oil recovery (Grane), feed for the methanol plant at Tjeldbergodden, and for power plants and supplies to households and industries in Haugesund and Stavanger.

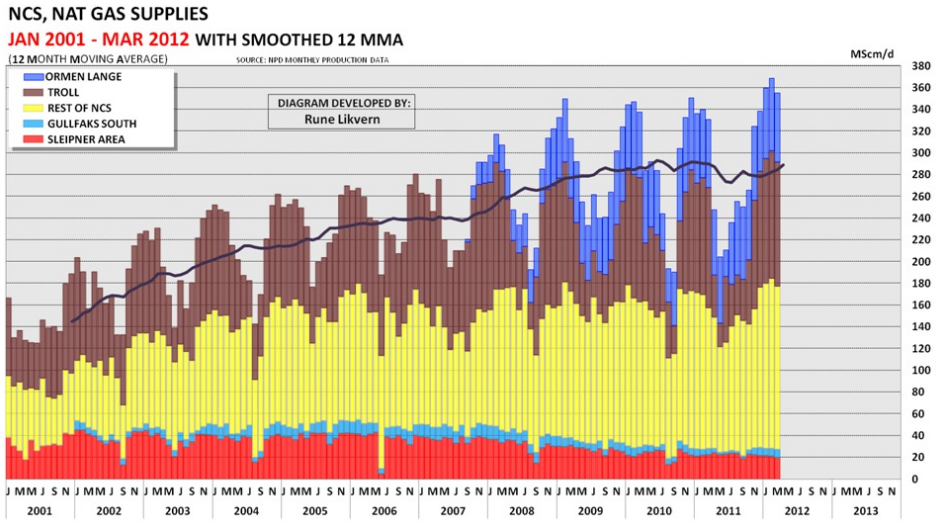

Figure 03: *The figure shows actual total natural gas production split by some major fields and groups of fields from January 2001 to March 2012. The figure is based upon monthly NPD data.*
A 12 Month Moving Average (12 MMA)black line is included in the chart. In January 2012, Norwegian natural gas production reached a new monthly high. NOTE: The chart shows production per calendar day, thus variations in flows from one day to another are normal.

The chart above also illustrates the seasonal variations in buyers' nominations for Norwegian natural gas. The chart illustrates that during recent winters two fields, Ormen Lange and Troll, accounted for around 50% of the total Norwegian gas deliveries. Most Norwegian natural gas is sold under long term contracts.

In North America, natural gas production is subject to less seasonal variations than it is in Europe. In North America, seasonal variations in demand are normally covered by storage withdrawals/injections. In Europe seasonal variations are to a larger extent covered by a combination of storage withdrawals/injections and more production elasticity designed into the production installations and pipelines.

For January 2012, the NPD reported Record gas sales in January, which supports the forecast shown in Figure 1.

R/P AT END 2011 AND WHAT IT SUGGESTS FOR FUTURE PRODUCTION

The ratio for Reserves over Production, (R/P), may be a helpful parameter in perceiving future

production developments. A low R/P ratio suggests that production should be expected to decline and a high R/P suggests production levels may be sustained or even grow.

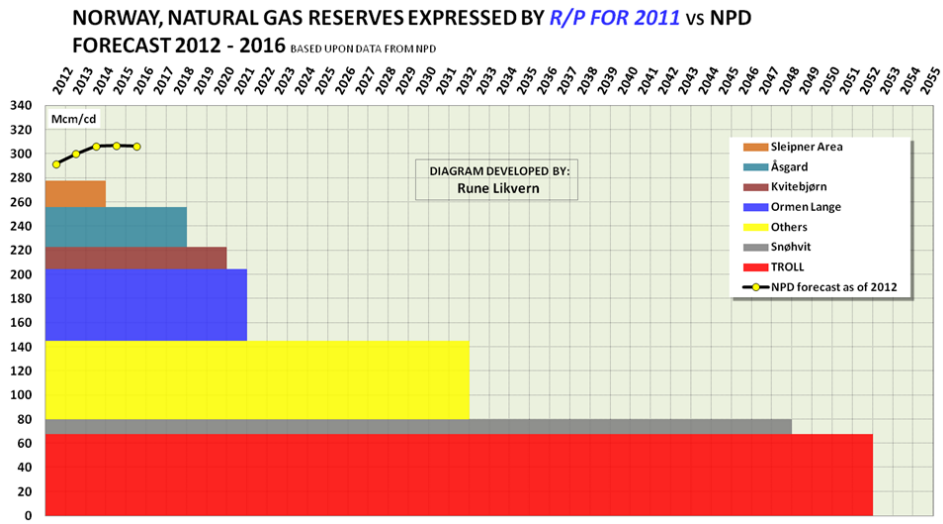

Figure 04: *The figure shows the duration of production of natural gas from fields and groups of fields on the Norwegian Continental Shelf (NCS) by applying the R/P ratio at year-end 2011. In the real world the production will not follow a rectangular profile (although it would be desirable for economic reasons).*

As reservoirs deplete they will at some point (for natural gas normally at around 70 - 80% depletion) experience a loss of productive potential and follow an exponential decline. The figure also shows the NPD's recent forecast for the years 2012 to 2016. The figure is based on reserve estimates and production data from the NPD at the end of 2011 and includes all fields in production and under development, like Gudrun, Gaupe, Skarv, Valemon, and Martin Linge.
NOTE: The figure shows production per calendar day.

The R/P rectangles above have varying degrees of elasticity and some fields had higher productive potential than what buyers asked for during the gas year 2010 (the gas year starts in October and lasts through September the following year). The fields' elasticity is also related to facilities constraints like liquefaction (LNG) capacity for Snøhvit and by production and export capacities for Ormen Lange (which could be upgraded if new fields are landed at Nyhamna) and by treatment capacities at Kollsnes for Kvitebjørn and Troll.

Based upon NPD data, the Sleipner area had an R/P of around 2.7 as of end of 2011, and this suggests that the production from the Sleipner area is about to enter into a steep decline.

The Åsgard fields and later Kvitebjørn are expected to be subject to declines in their productive capacities in the next few years as these fields continue to deplete.

Kollsnes (Troll and Kvitebjørn) and Ormen Lange are providing most of the swing production for seasonal demand. This leaves primarily other fields (see Others in Figure 3) as sources for any near term growth in natural gas production from the NCS.

As Figure 3 illustrates, Others has, in recent years, compensated for the declining production from the Sleipner area. A look at the R/P ratios for the fields and group of fields shows when new developments are scheduled to start flowing, and their expected production levels leaves little expectation for an increase in total production. For the near future, it is now expected that Others will primarily compensate for declining production from aging and depleting fields.

Figure 4 with the R/P ratios suggests that the production from NCS could grow during 2012 relative to 2011 and that the production then may remain on a plateau towards 2015/2016 before it enters into a steep decline towards 2020 and beyond, as shown in Figure 1.

DISCOVERIES IN THE NORWEGIAN SEA IN PLANNING FOR DEVELOPMENT

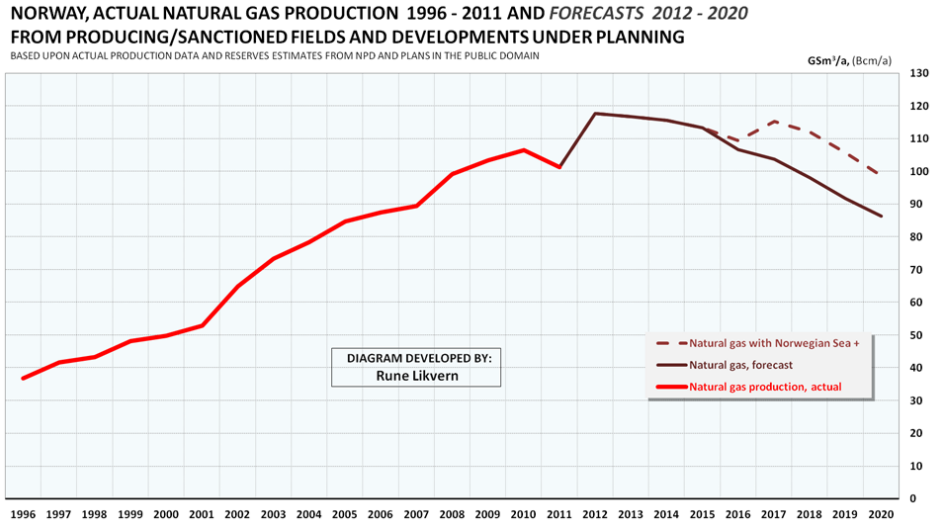

Figure 05: *The chart shows actual production of Norwegian natural gas (thick red line), a forecast towards 2020 for producing and sanctioned developments (thinner dark red line) and a forecast for fields in the Norwegian Sea (Aasta Hansteen, Linnorm and 6506/6-1, dashed dark red line) in planning and scheduled to start flowing late 2016.*

Plans now call for multiple coordinated field developments in the Norwegian Sea to enable a trunk line NSGI (Norwegian Sea Gas Infrastructure) to Nyhamna (receiving facility for the Ormen Lange and start of the Langeled pipeline).

The fields that are now considered for development in the Norwegian Sea are Aasta Hansteen (formerly Luva) 46 Bcm (Billion cubic meters), 1.300 meters of water, Linnorm, 24 Bcm and 6506/6-1, 27 Bcm.

These 3 discoveries are now estimated to hold a total of 100 Bcm of recoverable gas, which represents the same volume that Norway presently exports and that the UK consumes annually.

These fields in the Norwegian Sea may extend the plateau for total Norwegian gas deliveries by 2 - 3 years, (refer to Figure 5).

Based upon publicly available data it has been estimated that Aasta Hansteen has a breakeven price of 1.60 – 1.70 NOK/Scm (0.50 to 0.55 p/therm) at delivery points like NBP (National Balancing Point in Heeren) in the UK or if related to the US market, $8.00 - $8.50/Mcf at Henry Hub.

This serves as an illustration of what price buyers may expect for future supplies of Norwegian natural gas from new developments.

The chart in Figure 5 also illustrates that as this decade comes to an end it becomes harder to sustain the plateau for natural gas deliveries from the NCS, and also that the developed discoveries tend to be smaller and thus have a short plateau and most likely steep decline rates.