Production from Giant Gas Fields in Norway and Russia
- and Subsequent Implications for European Energy Security

Stockholm
2010-04-28

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Natural Gas Consumption is Increasing Steadily

- Natural gas accounts for 24% of world energy use.
- IEA predicts an annual growth rate of 1.8% per year between 2006-2030.

Source: BP Statistical Review 2009

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Peak Gas? - Giant Gas Discoveries per Decade

- Conventional gas discoveries peaked in the 1970’s.
- A peak in discoveries must give a peak in production.

UK Gas Production Peaked in 2000

- The biggest gas producer of the EU.
- Became net importer of gas in 2004.
- The UK and the Netherlands produce 70% of EU gas output.


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U.S. Gas Production Peaked in 1973?


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Shale Gas - a Game Changer in the U.S.?

Shale gas is costly to extract and require intense energy and water to produce.

- Shale plays cover much larger areas and require at least ten times the number of wells.
- Barnett shale gas wells, on average, decline by 39% from Y1 to Y2 and by 50% from the Y1 to Y3.
- Drilling and hydraulic fracturing of a horizontal shale gas typically requires about 11 million liters of water.

Sources: IEA (2009); EIA (2009)

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Shale Gas - a Game Changer in the U.S.?

Sources: Campbell (2008); EIA (2010)
Many Different Views on Future U.S. Production

- No significant increase of production is forecasted
- Imports are expected to continue.

Sources: EIA (2010), Annual Energy Outlook 2010, Early Release

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Two Major Regional Gas Markets

North America

Russia - Europe


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Europe’s Gas Imports Must Increase Dramatically

- The production of gas within the EU peaked in 1996.
- Imports must increase by up to 90% within 20 years to meet forecasted demand.
- Available LNG supply for the EU may amount to only 130 bcm by 2030.


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Russia and Norway - Main Suppliers to the EU

EU gas imports 2006.

- 62% of imports from Russia and Norway.
- Russia and Norway* both by pipeline.
- Algeria both pipeline and LNG.

*In 2008 Snöhvit began LNG exports to Europe and the USA (production goal 6 bcm).


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Central Asia and MENA Supply Risks

- The Middle East and North Africa has large gas resources but rapidly growing energy consumption.

- There are now more people in the Middle East than in USA and Canada.

- Significant gas discoveries in Turkmenistan. However most old fields are depleted and gas exports have started to China.

- Beyond 2013, the global LNG expansion is uncertain.

The Petroleum Producing Regions of Norway

• The Norwegian shelf is divided in three separate petroleum systems.

• 66% of production in the North Sea (2008).

• 31% of production in the Norwegian Sea (2008).

• 2.4% of production in the Barents Sea (2008).


Source: NPD,(2008)
Norway is becoming a mature gas producer

• In 2008 Norwegian gas production was 99 bcm/year.

• 80% of Norway’s initial reserves are concentrated in only 10 giant gas fields.

• All Norwegian giant gas fields have been put in to production.

• With the exception of Ormen Lange and Snøhvit, all giant fields have already reached their planned production level.


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Declining discovery trend

- No giant gas field discovered in Norway during the last 10 years.
- The reserves of Ormen Lange downgraded by 25% in 2010.
- Lofoten & Vesteraalen region resource estimate reduced by 50% in April 2010.
- Only one giant gas field discovered in the Barents Sea.

Norwegian Gas Discoveries 1966-2005

Norway – A Bottom-up Analysis

Norwegian Natural Gas Production Forecast – Reference Scenario

• Field-by-field study of Norwegian gas production.
• Contingent and undiscovered resources included.


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Limited Norwegian Potential for Increase

- Total Norwegian gas production peaks between 2015 and 2020.
- By 2030 Norwegian pipeline exports 80-95 bcm/year.


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Russia – The Saudi Arabia of Natural Gas

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<th>Natural Gas Production</th>
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A peak in discoveries must give a peak in production.

Declining Discovery Trend

**Russian Giant Gas Discoveries per Decade**

- **Western Siberia, Urengoy (1966)**
- **Yamal Peninsula, Bovanenko (1971)**
- **Barents Sea, Shtokman (1988)**


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Western Siberia, Europe’s Energy Centre

- Nadym Pur Taz (NPT) Region is the world’s largest gas production center.
- Over 90% of Russian production (about 20% of global production).

Source: Gazprom
The NPT Region is about to Peak

Source: Söderbergh, B., (2010). Production from Giant Gas Fields in Norway and Russia and Subsequent Implications for European Energy Security
Development of New Areas – Tough Areas Left

- The Shtokman field, arctic offshore.
- The Yamal Peninsula – harsh weather conditions.
- East Siberia and Sakhalin – remote areas.
Yamal – The Future Russian Gas Centre

Yamal Peninsula Production Forecast

Source: Söderbergh, B., (2010). Production from Giant Gas Fields in Norway and Russia and Subsequent Implications for European Energy Security

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Future Russian Gas Production and Demand

Limited increase of export potential due to increasing Russian domestic demand.

Source: Söderbergh, B., (2010). Production from Giant Gas Fields in Norway and Russia and Subsequent Implications for European Energy Security

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China’s Soaring Energy Demand.

- Natural gas: Small part of China’s energy mix, 3% in 2004, but rapidly increasing.
- China may need 400 bcm of natural gas per year by 2030.

Sources: BP (2009), PetroChina (2009).

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Russian Gas to China – From Where?

- Declining production in NPT Region.
- Yamal development may have been delayed too long.

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Limits to Available Gas Supplies for Europe

Source: Söderbergh, B., (2010). Production from Giant Gas Fields in Norway and Russia and Subsequent Implications for European Energy Security

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If Yamal Delayed - No European Export Increase

Source: Söderbergh, B., (2010). Production from Giant Gas Fields in Norway and Russia and Subsequent Implications for European Energy Security

Yamal development delayed five years.
Future Supply May not Meet Projected Demand

1. Norwegian gas production peaks within 10 years. Increased imports from Russia needed.

2. Yamal production by 2012 and modest Russian domestic demand growth is crucial for increasing Russian exports.

3. Pipeline to China from Western Siberia – Start of supplies 2014? China may consume all available net increases of Russian gas exports.

4. Unconventional gas hype may create risky illusion of energy abundance.

5. The long-term availability of sufficient gas supplies for Europe is associated with serious risks.

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Thank You for Your Attention!

Source: StatoilHydro

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