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# A Coming European Gas Crisis?

- The Future Supply from Norway and Russia.

Stockholm

November, 2009.

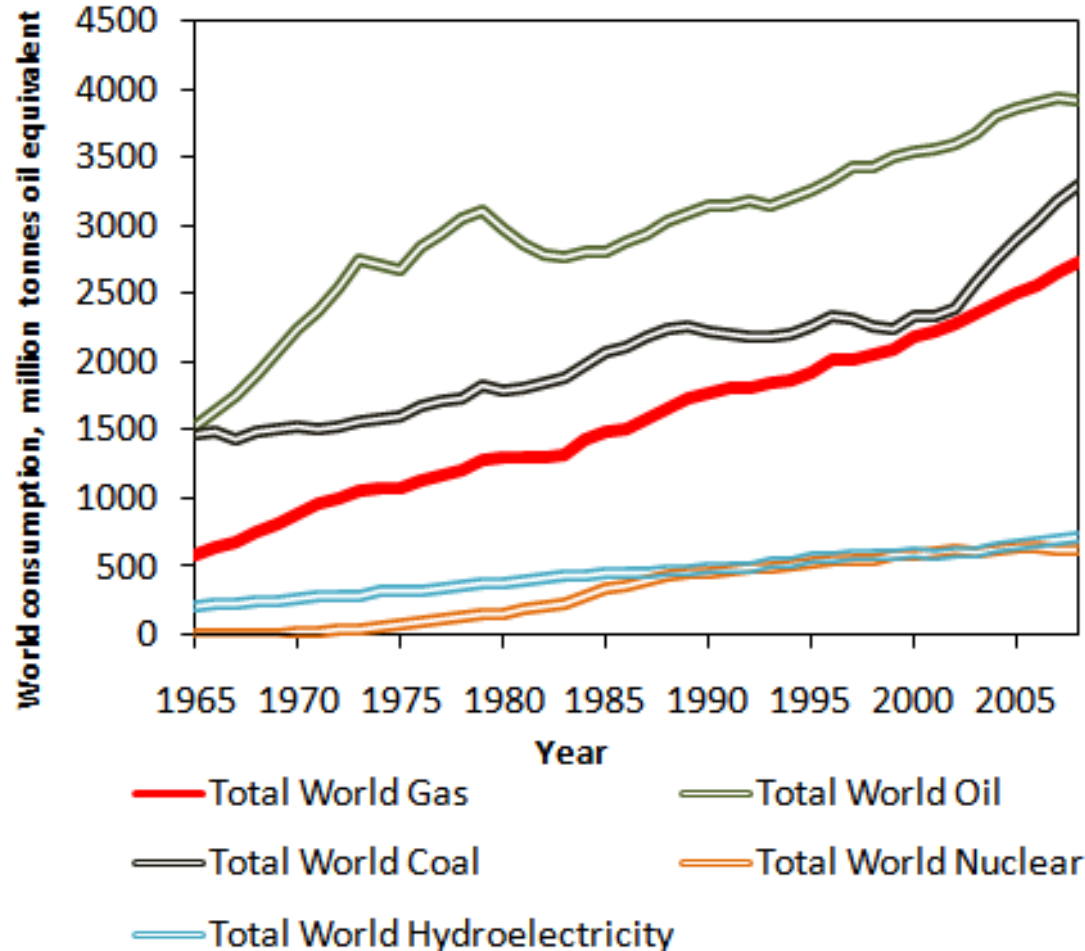


Source: StatoilHydro

Bengt Söderbergh, PhD Student, Global Energy Systems, Uppsala University



# Natural Gas Consumption is Increasing Steadily



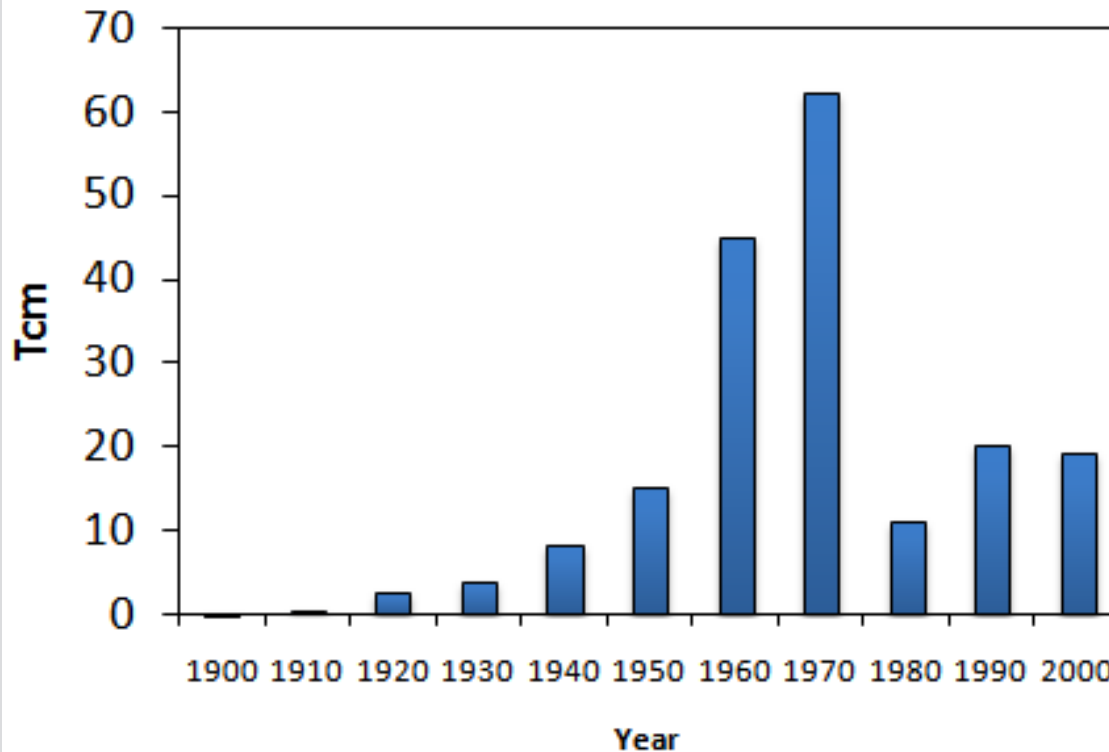
- Natural gas accounts for 24% of world energy use.

- IEA predicts an annual growth rate of 1.8% per year between 2006-2030.

Source: BP Statistical Review 2009



# Peak Gas? - Giant Gas Discoveries per Decade



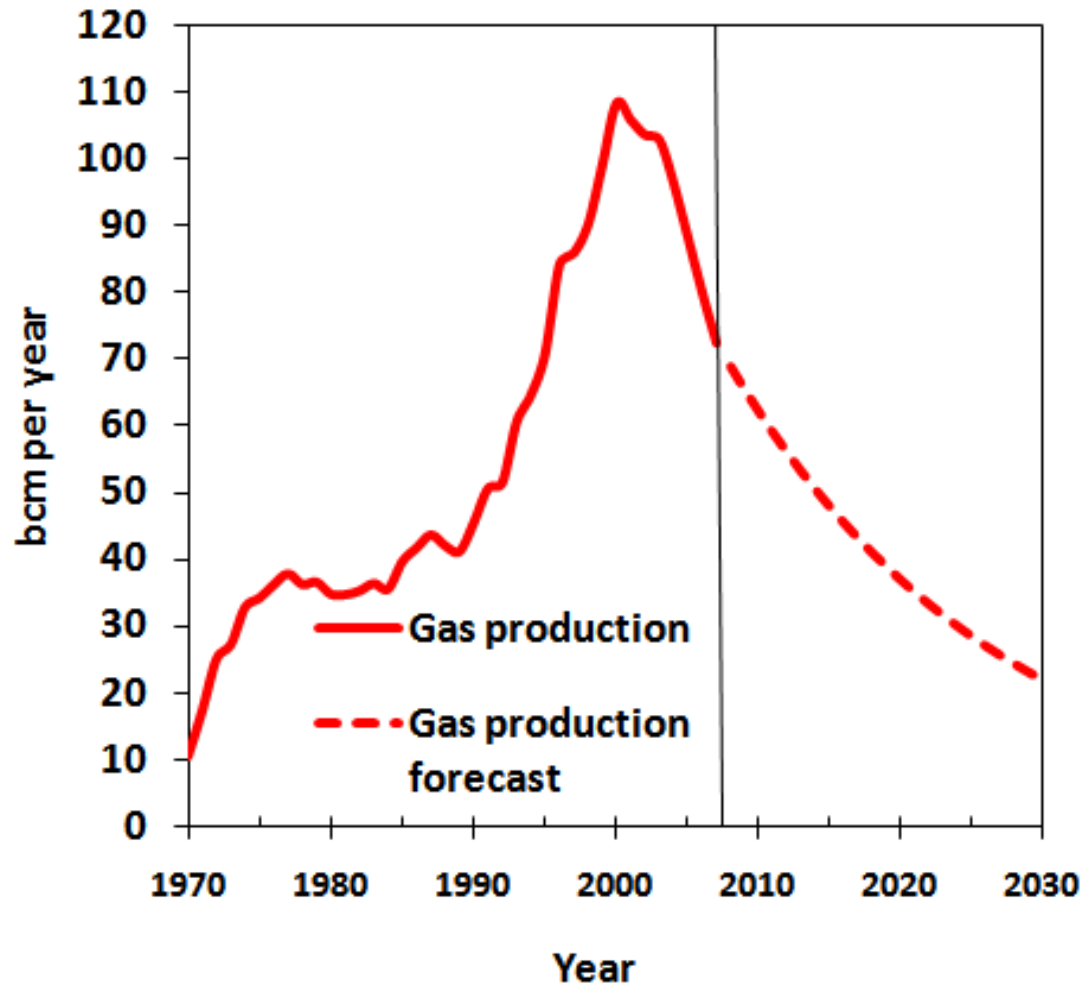
Source: Söderbergh, B. Global Energy Systems Database

- Conventional gas discoveries peaked in the 70's.

- A peak in discoveries must give a peak in production.



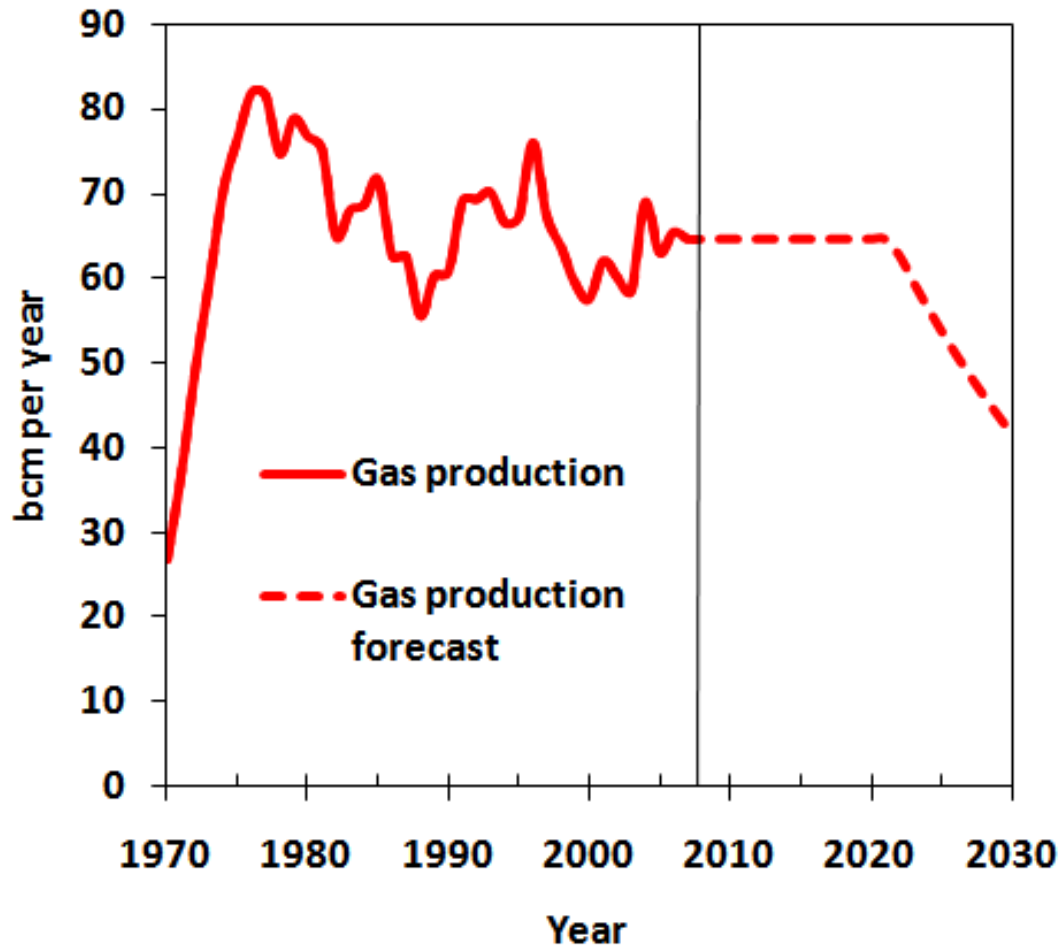
# UK Gas Production Peaked in 2000



- 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



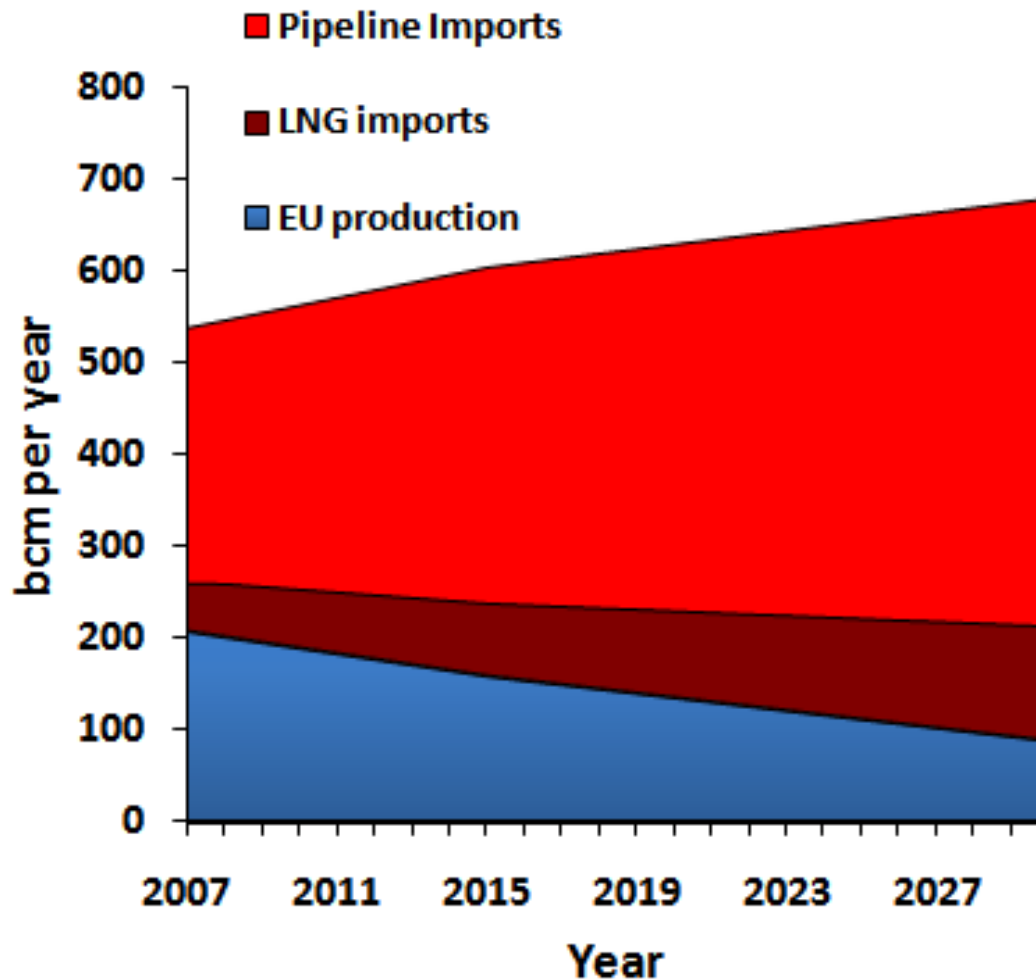
# Declining Production Trend in the Netherlands



- Second largest producer in the European Union.
- Very dependent on the giant Groningen field.
- Groningen is more than 60% depleted.



# Europe's Gas Imports Must Increase Dramatically

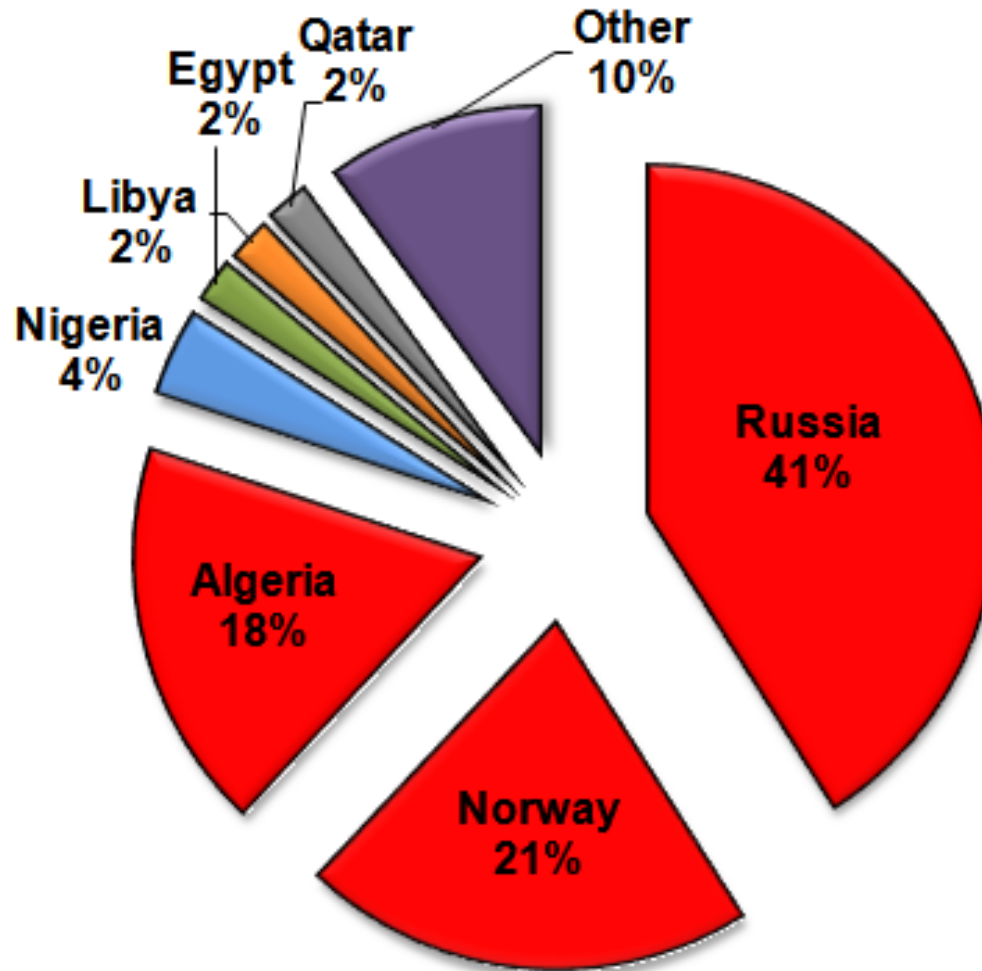


- The production of gas within the EU peaked in 1996.
- Imports must increase by 90% within 20 years to meet forecasted demand.
- Available LNG supply for the EU may amount to only 140 bcm by 2030.



# Main Suppliers to the European Union

## EU gas imports 2006.



- 80% of imports from Russia, Norway and Algeria.

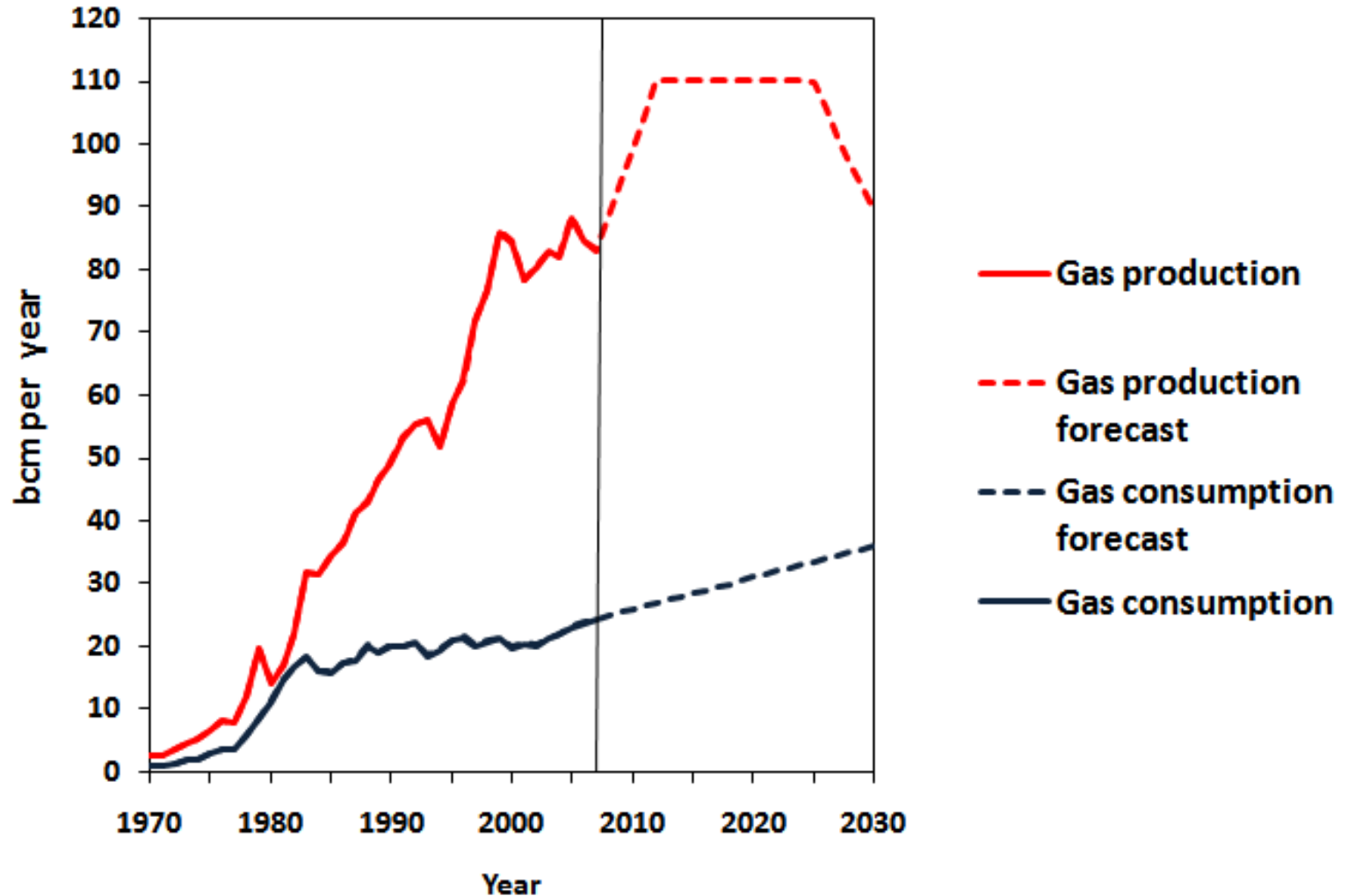
- Russia and Norway\* both by pipeline.

- Algeria both pipeline and LNG.

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



# Limited Algerian Potential for Increase

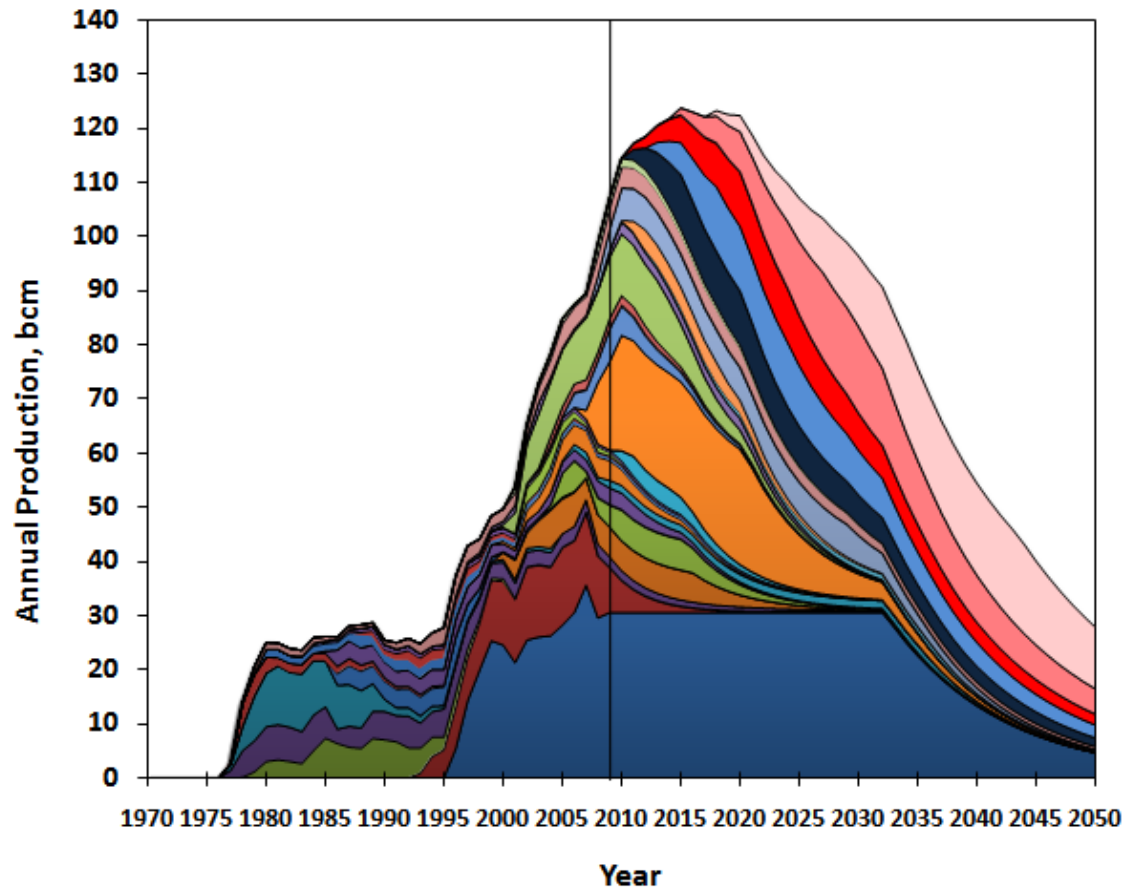


Sources: BP Statistical Review 2008, Campbell (2008).



# Norway – A Bottom-up Analysis

Norwegian Natural Gas Production Forecast – Reference Scenario



- In 2008 gas production 99 bcm/year.
- Field by field study of Norwegian gas production.
- Contingent and undiscovered resources included.



# 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).

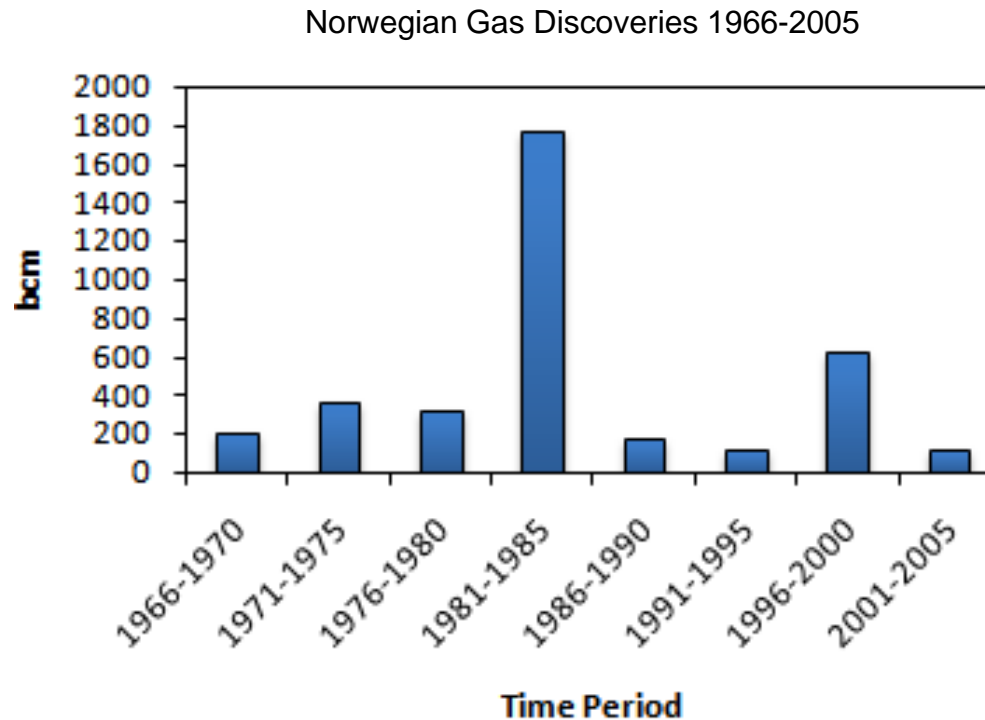


# Norway is becoming a mature gas producer

- 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.
- The production from current reserves in the Norwegian North Sea peaked in 2006 at 73 bcm/year .
- Estimated peak in production from Norway's current reserves in 2010 at 115bcm/year.



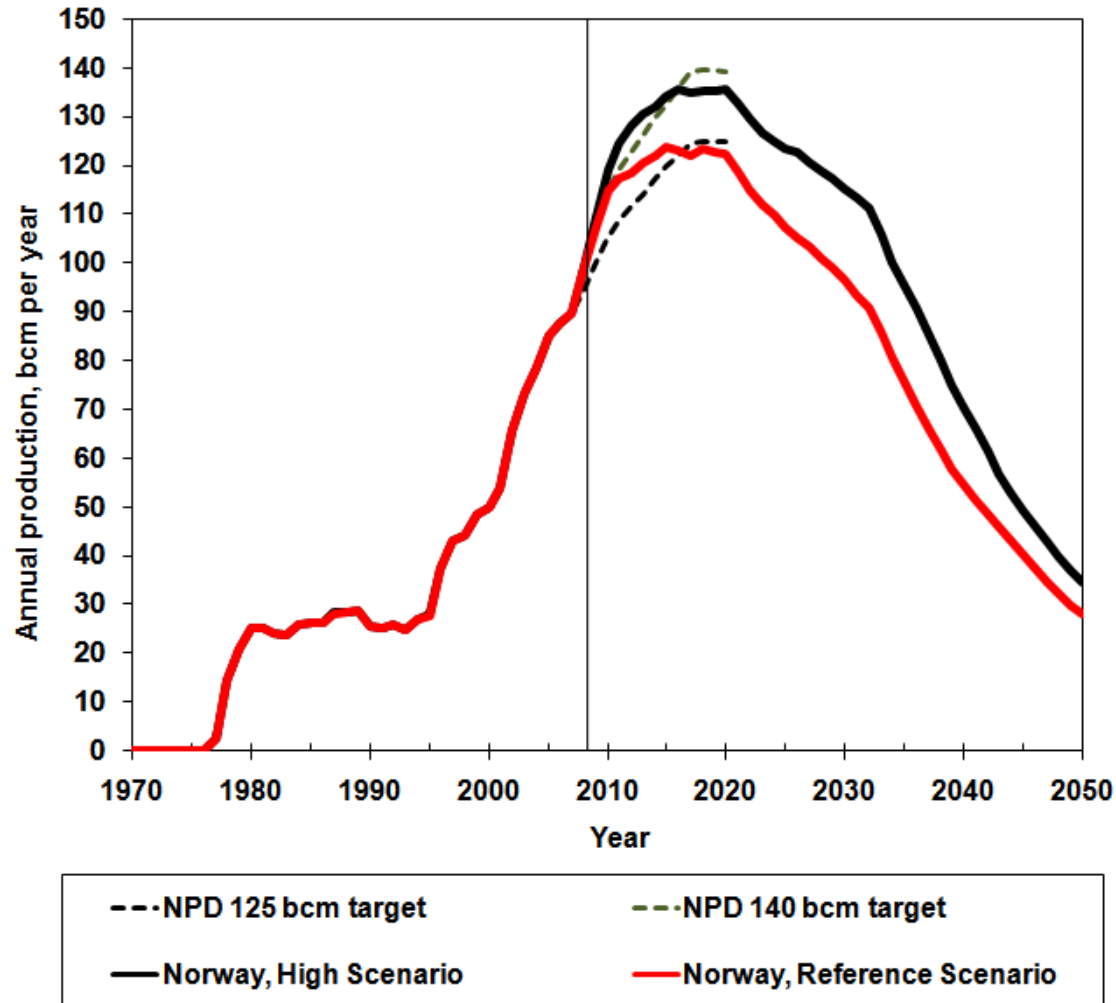
# Declining discovery trend



- No giant gas field discovered in Norway during the last 10 years.
- About 85 exploration wells drilled in the Barents Sea since 1980.
- Only the Snohvit and Goliat fields discovered in the Barents Sea.



# Limited Norwegian Potential for Increase



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



# Russia – The Saudi Arabia of Natural Gas

No	Natural Gas Production Country	bcm 2008	2008 share of total
<b>1</b>	<b>Russian Federation</b>	<b>602</b>	<b>20%</b>
2	US	582	19%
3	Canada	175	6%
4	Iran	116	4%
5	Norway	99	3%

No	Natural Gas Proved reserves Country	tcm 2008	2008 share of total
<b>1</b>	<b>Russian Federation</b>	<b>43</b>	<b>23%</b>
2	Iran	30	16%
3	Qatar	25	14%
4	Turkmenistan	8	4%
5	Saudi Arabia	8	4%

Highest  
Production.

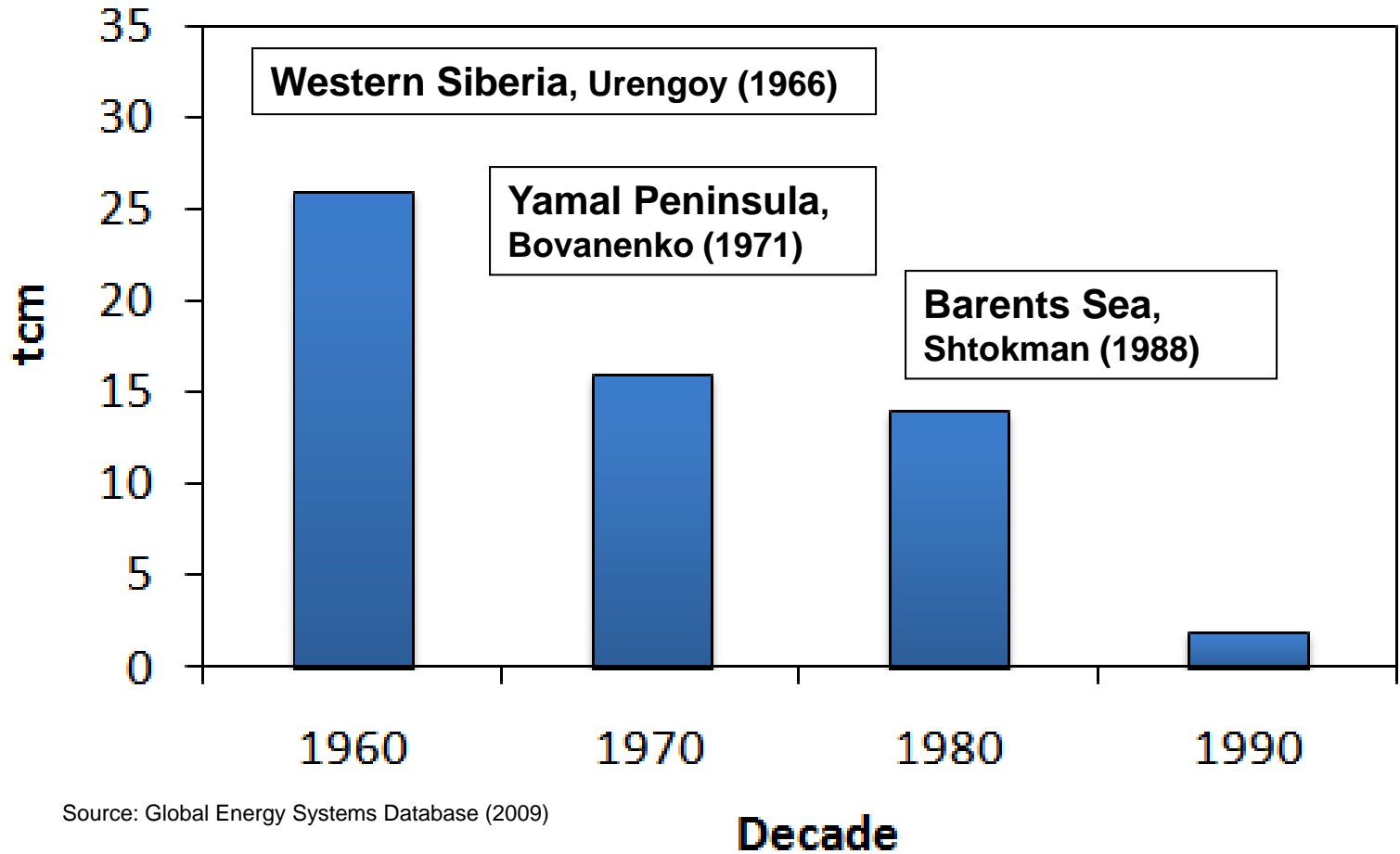
Largest  
Reserves.

Figures are for 2008.



# Declining Discovery Trend

## Russian Giant Gas Discoveries per Decade

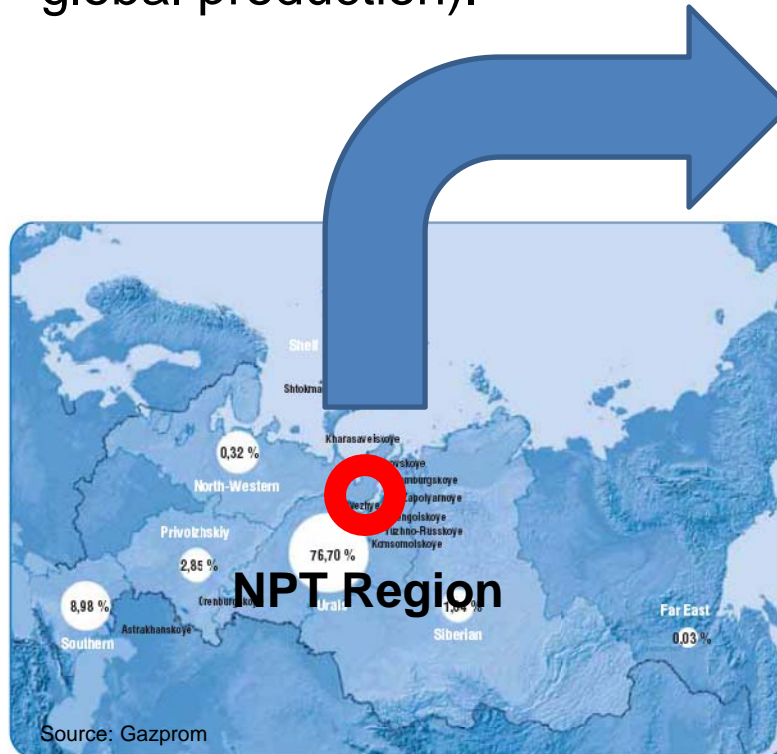


A peak in discoveries must give a peak in production.



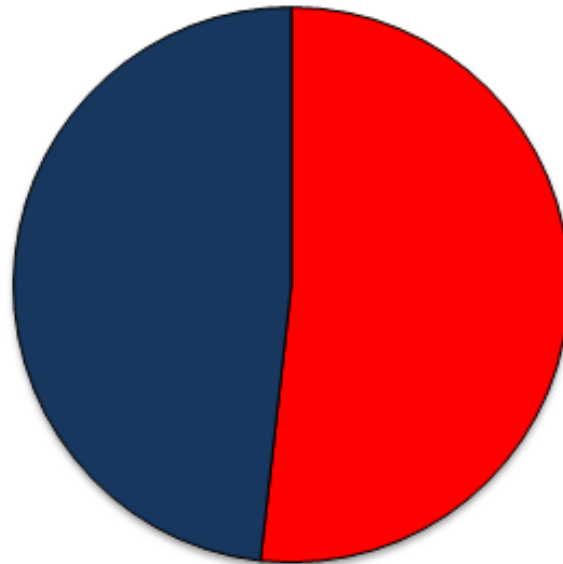
# Western Siberia, Europe's Energy Centre

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





# Russian Giant Gas Fields – The Big Three



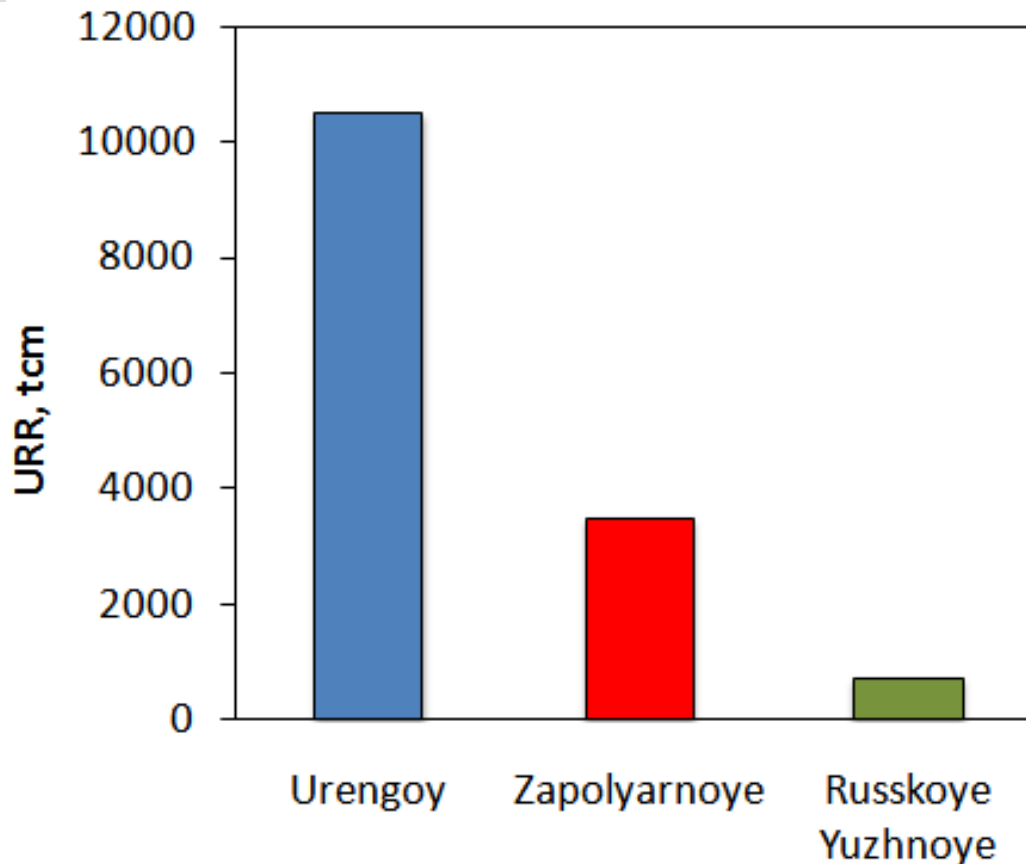
■ Urengoy, Yamburg and Medvezhye    ■ Other

Sources: Preliminary Data, Söderbergh (2009)

- More than 95% of the URR of Russian gas are in giant fields and semi-giant fields.
- Russian gas production has been dominated by three super-giant fields; Urengoy, Yamburg and Medvezhye.
- In 2005 the three fields produced about 50% of Russian gas production.
- The three fields are in decline!



# Managing Declining Production from the Big Three

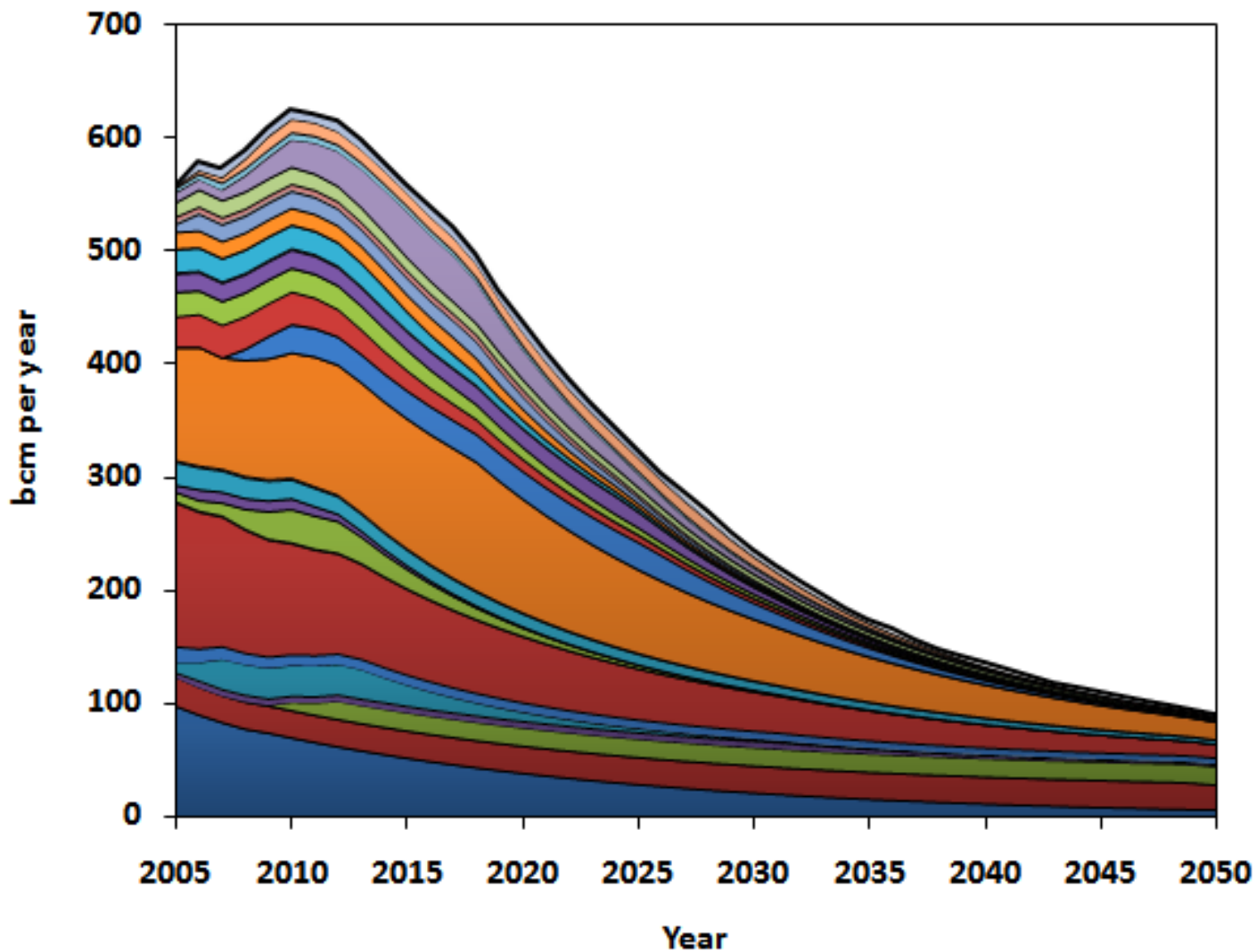


Sources: Gazprom (2005-2009), Laherrère (2007).

- New NPT fields commissioned to offset declining production.
- Zapolyaroye  
Startup year: 2001
- Yuzhno-Russkoye  
Startup year: 2007
- New fields are smaller in size.



# The NPT Region is about to Peak



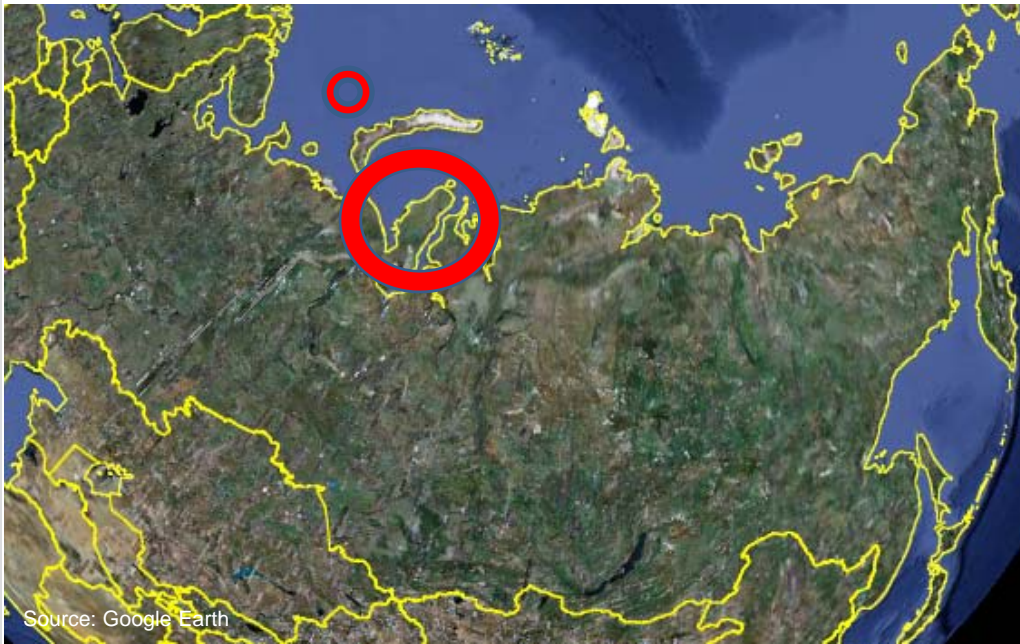
Source: Preliminary data, Söderbergh (2009)

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# Development of New Areas – Tough Areas Left



- The Shtokman field, harsh weather conditions, icebergs...

- The Yamal Peninsula – Yamal meaning “The End of the Earth”, Nenets language.



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# Can Europe Rely on Russia?

Five key factors are crucial for estimating future available supplies of natural gas from Russia to the European Union.

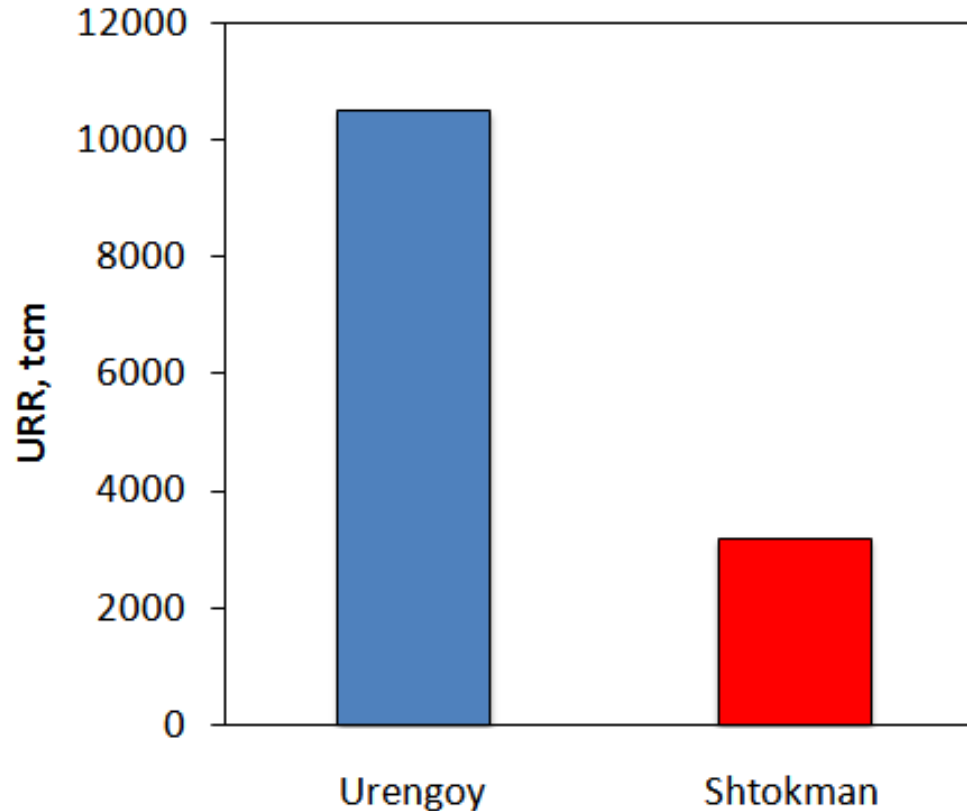


Source: Gazprom



# 1. Shtokman – Pushing the Limits

## Comparison of Reserves



Sources: Gazprom (2005-2009), Laherrère (2007).

- Discovery year: 1988. Estimated start 2014?

- 565 km to the port of Teriberka. Water depth > 300 m.

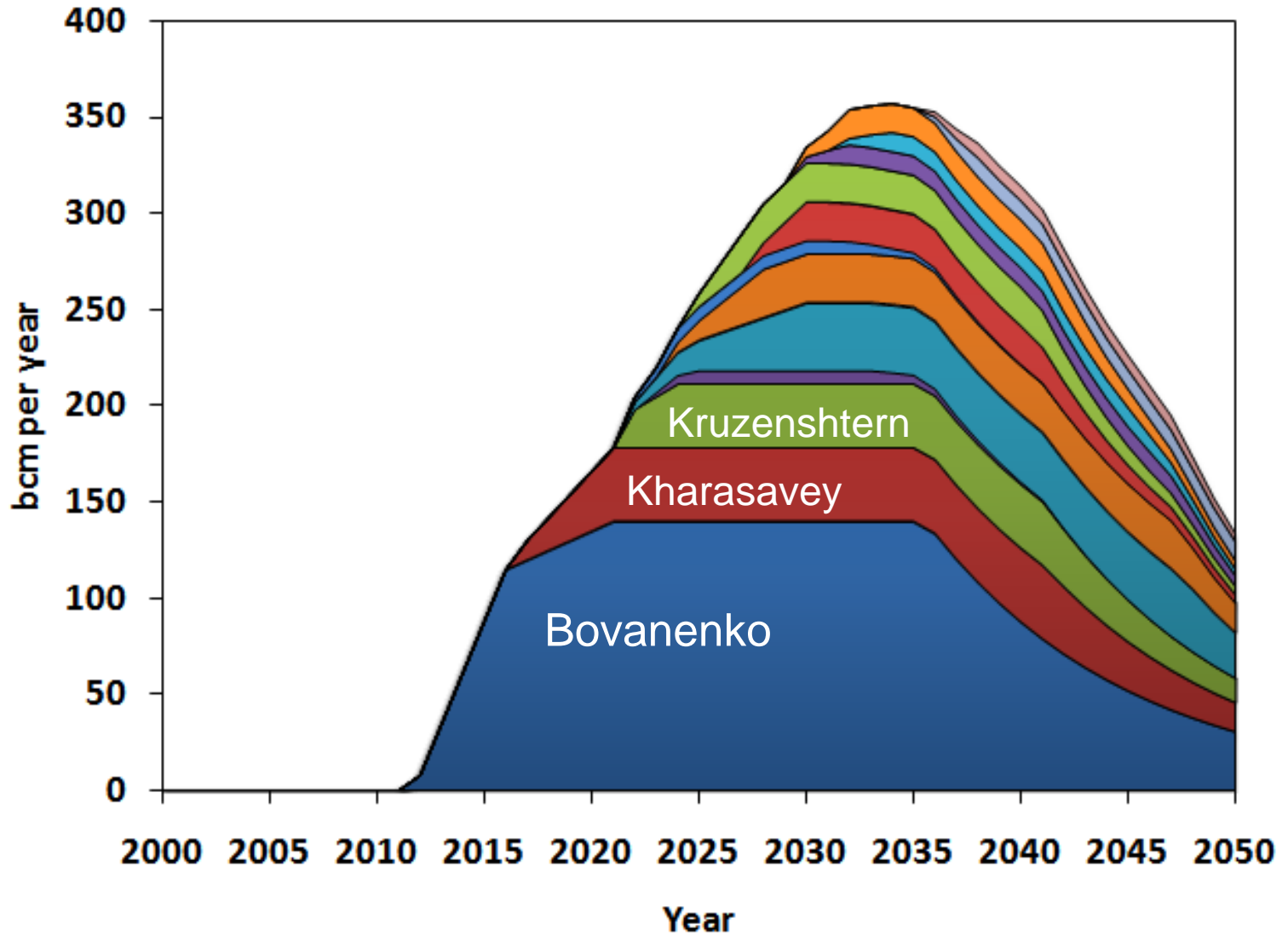
- Planned production level: 71 bcm/year.

- Urengoy peak production in 1987 was 304.5 bcm/year.



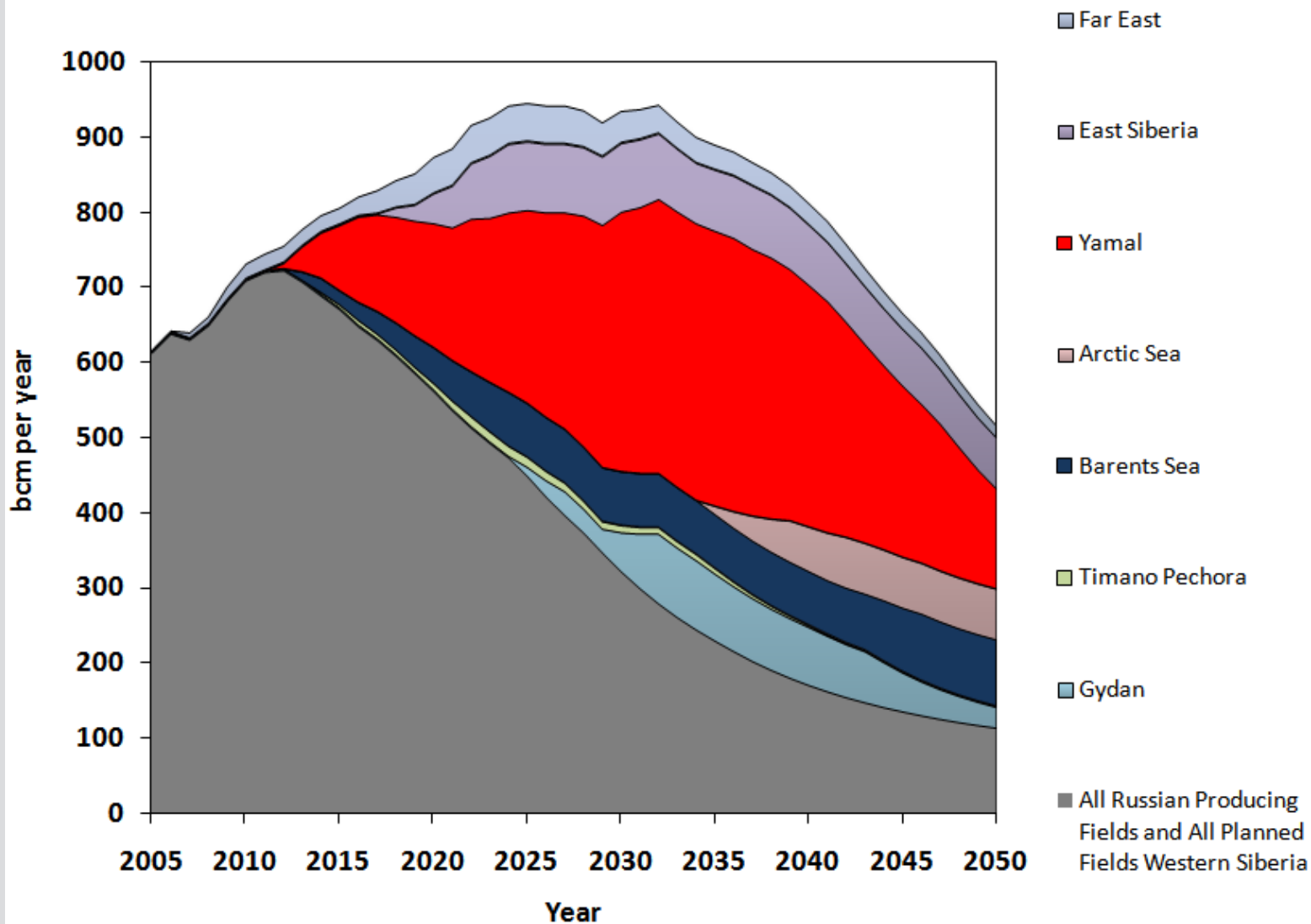
## 2. Yamal – The Future Russian Gas Centre

### Yamal Peninsula Production Forecast





# Are There Enough Resources and Time?





### 3. The Central Asian Card

- Russia needs Central Asian imports to match supply and demand. (61 bcm in 2007)
- “The New Great Game” – Central Asian oil and gas.
- Turkmenistan has promised increased gas supplies to Russia and Iran + start of exports to China!



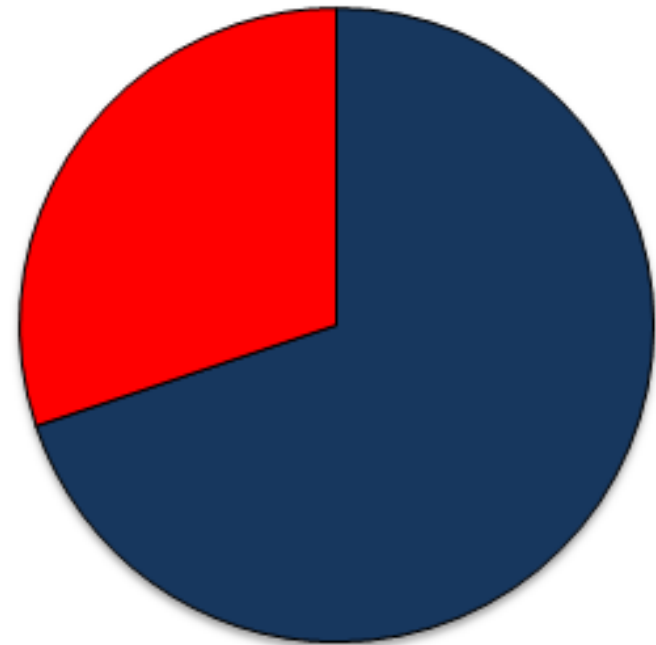
- Can Turkmenistan fulfill all its promises?
- Is there any gas left for Nabucco-pipeline?



## 4. Who Will Consume the Russian Gas?

	2008 (bcm/year)
Russian Production	602
Russian Consumption	420

- 70% of Russian natural gas production is consumed domestically.

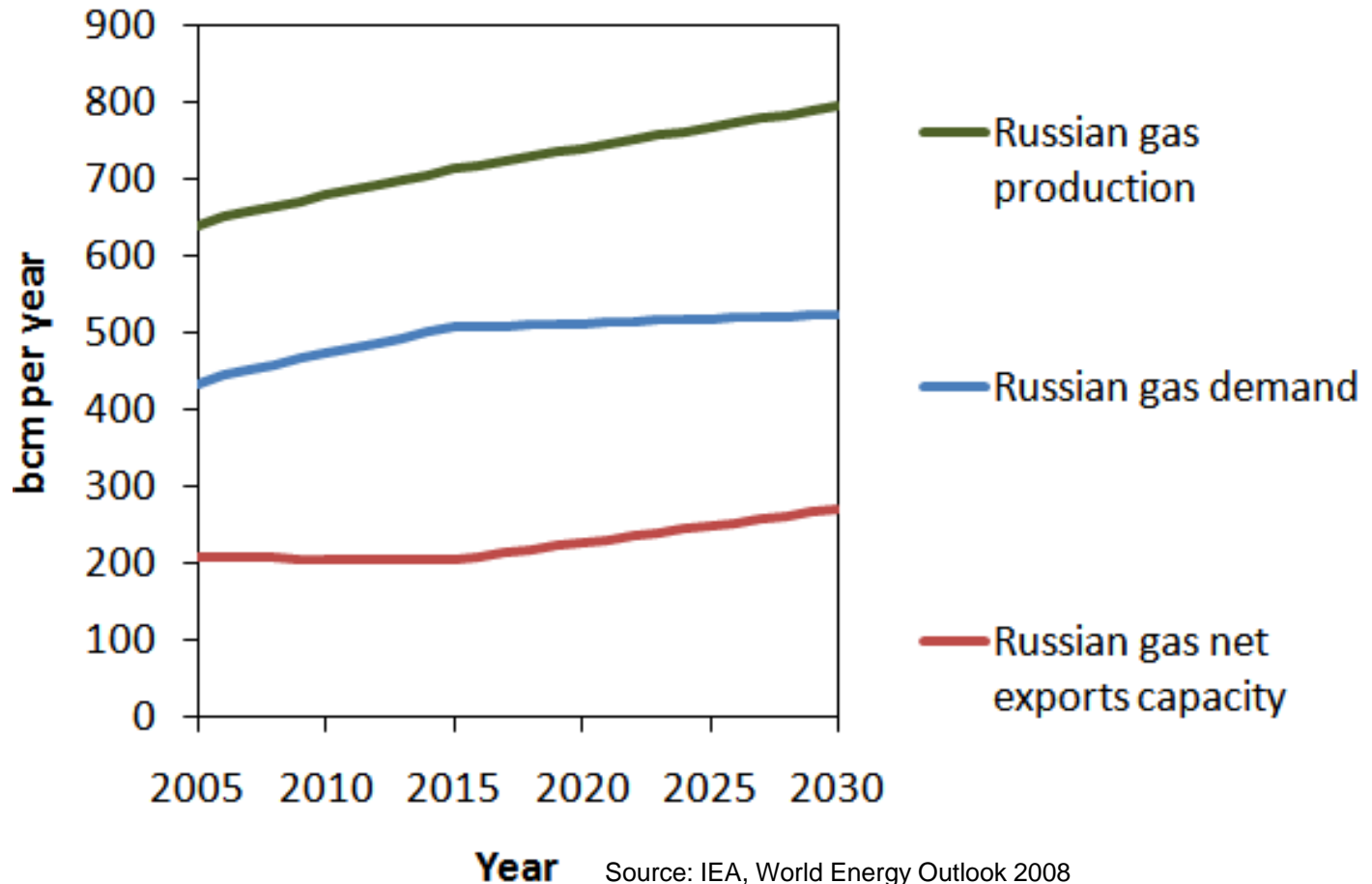


■ Domestic Consumption ■ Exports

Source: BP Statistical Review 2009



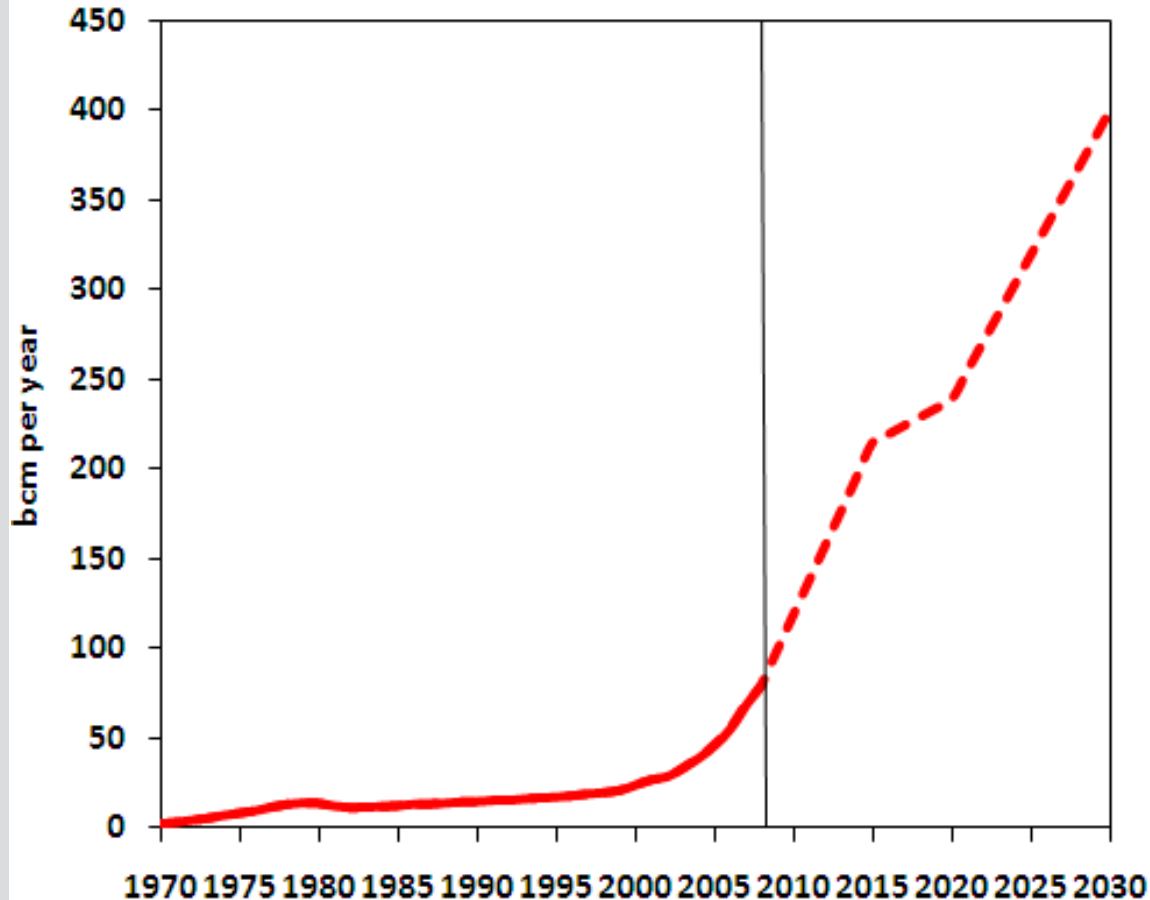
## 4. Future Russian Gas Production and Demand



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



## 5. 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).



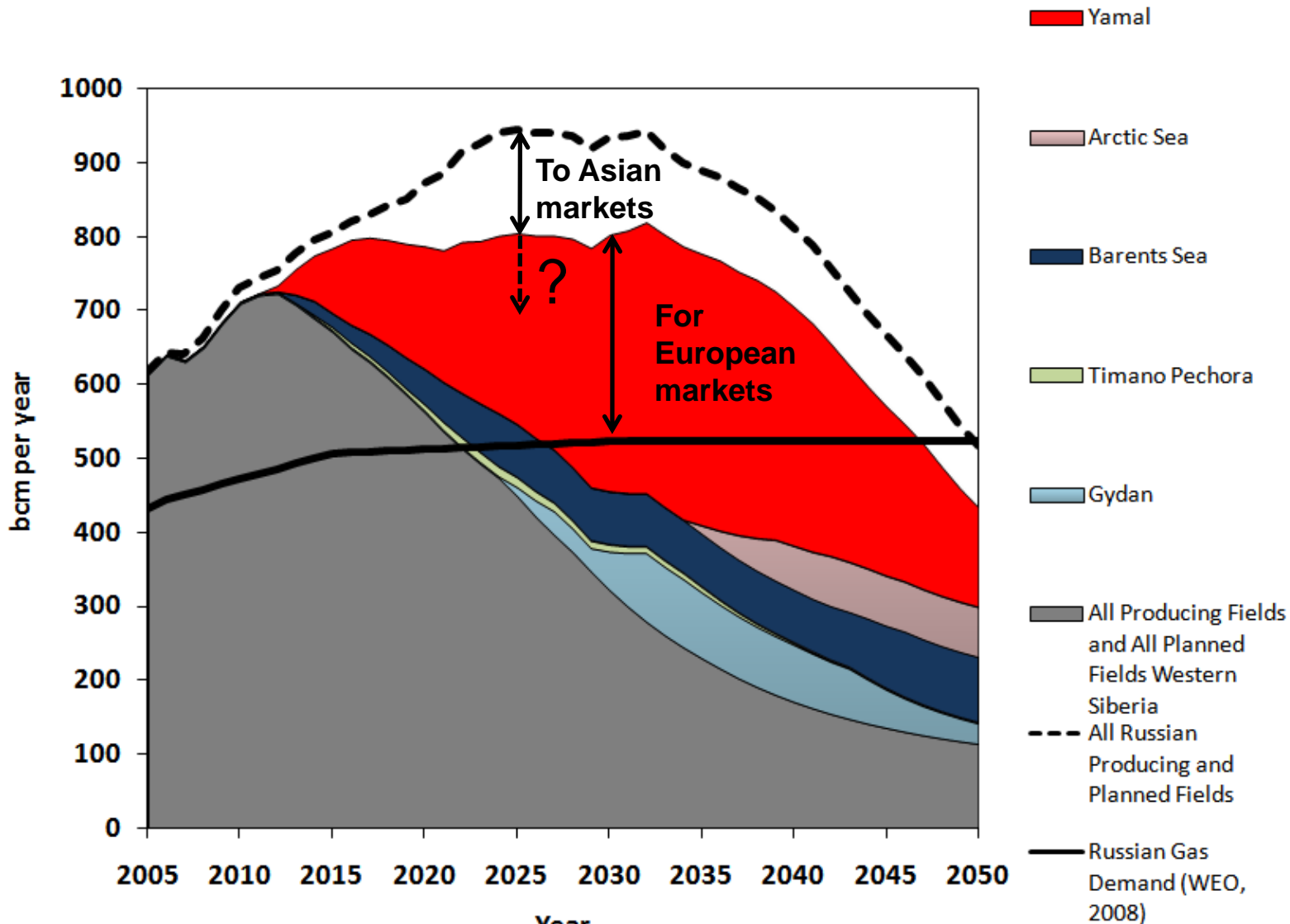
## 5. Russian Gas to China – From Where?



- Declining production in NPT Region.
- Yamal development may have been delayed too long.
- Most economic outcome? Eastern Siberia and Sakhalin.



# Limits to Available Gas Supplies for Europe

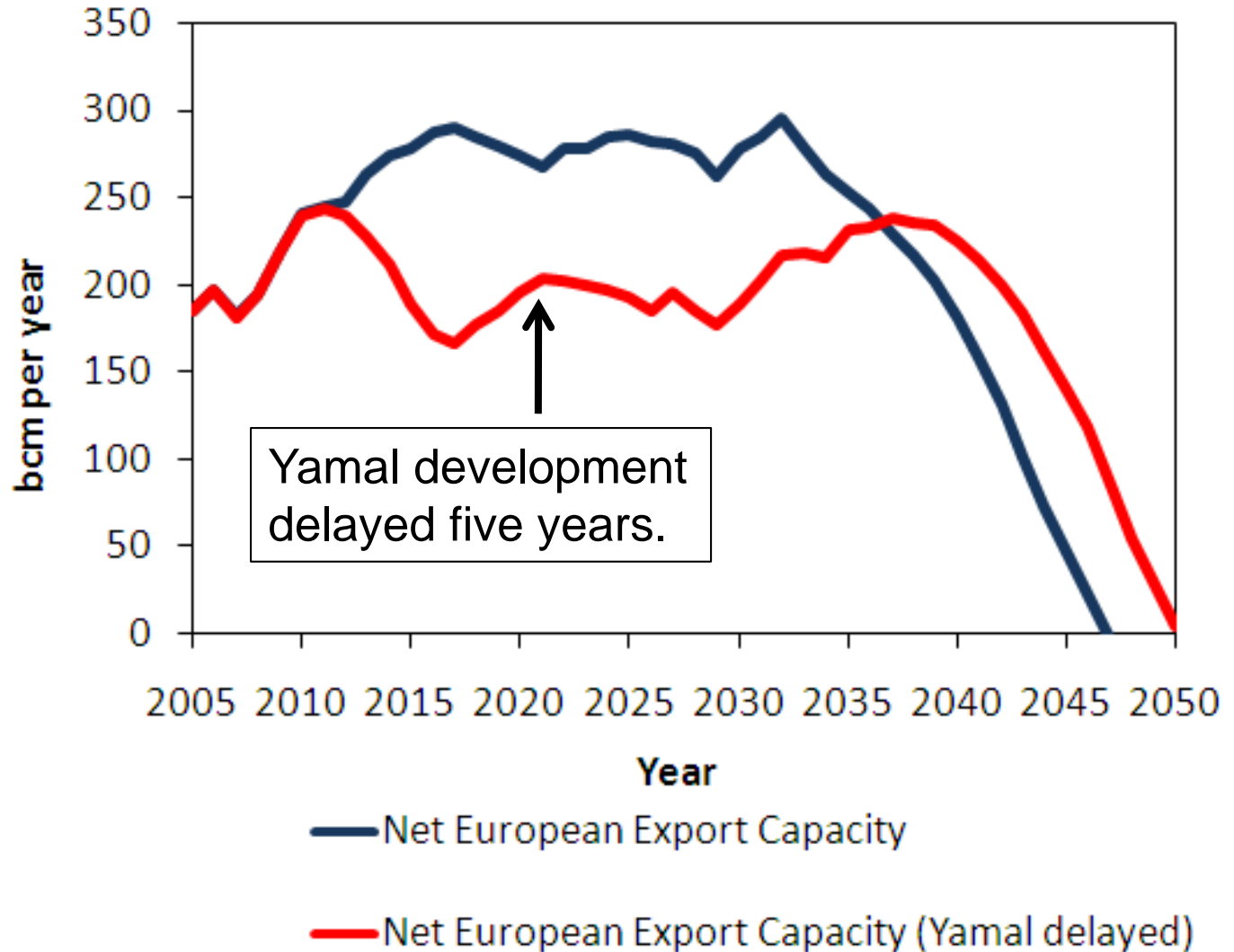


Source: Preliminary data, Söderbergh (2009)

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# If Yamal Delayed - No European Export Increase





# Future Supply May not Meet Projected Demand

1. Norwegian gas production peaks within 10 years. Increased pipeline imports from Russia needed. } Limited available LNG supplies.
2. Launch of Yamal production in 2012. Shtokman start in 2013. } Crucial for increasing Russian production.
3. How much gas will Central Asia be able to export to Russia? } China alternative consumer.
4. The development of Russian domestic demand. }
5. Pipeline to China from Western Siberia – Start of supplies 2013-2014? } China may consume all available net increases of Russian gas exports.



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# Thank You for Your Attention!



Source: StatoilHydro

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