



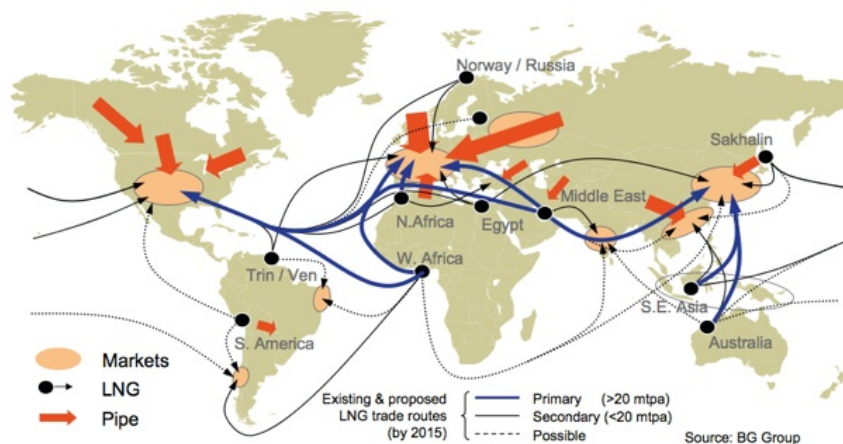
## European Gas Security: The Future of Natural Gas

Posted by [Euan Mearns](#) on May 13, 2008 - 10:00am in [The Oil Drum: Europe](#)

Topic: [Supply/Production](#)

Tags: [aspo](#), [berr](#), [european gas security](#), [gas markets](#), [italy](#), [lng](#), [nord-stream](#), [norway](#), [russia gas exports](#) [[list all tags](#)]

## Global gas the near future



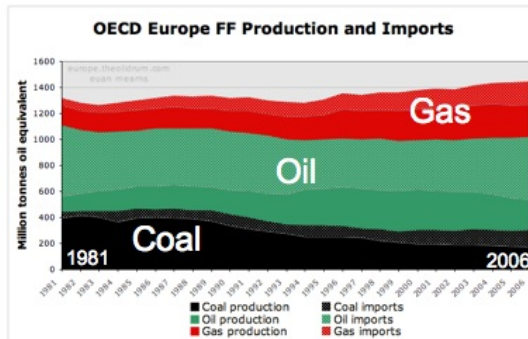
This is the talk I was honored to deliver to ASPO Italy on 3rd May 2008 at their annual conference in Turin. 24 slides below the fold plus narrative of what I said on the day. The narrative boxes are below the slides.

An Italian translation of this post is available [here](#). Thanks to Maurizio Moretto for the translation. Thanks are also due to [Jean Laherrere](#) of ASPO France for providing his interpretations of Russian and North African gas supplies.

## Why is natural gas important?

- Provides **29%** of OECD Europe's primary fossil fuel (ff) energy
- Home heating
- Heat and power for industry and commerce
- Electrical power generation
- Petrochemicals and fertilizer feedstock

- FF consumption in OECD Europe has been flat for 25 years
- Coal consumption falling and **natural gas consumption rising**

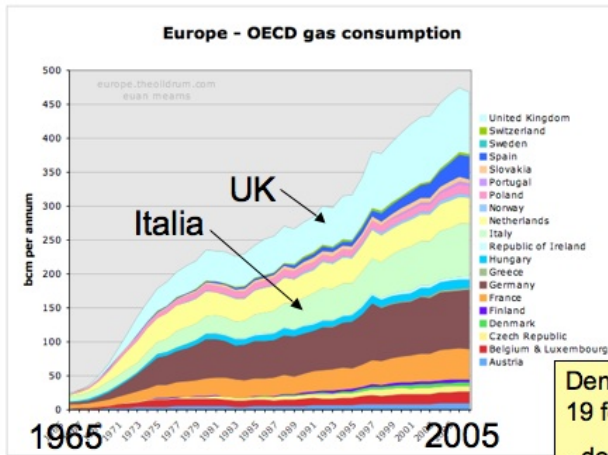


Natural gas provides 29% of OECD Europe's primary fossil fuel energy. It is used for:

- Home heating
- Heat and power for industry and commerce
- Electrical power generation
- Feedstock for chemicals and fertilizer

For the last 25 years fossil fuel consumption has been more or less flat in Europe. But as the use of coal has declined, the use of natural gas has increased.

# OECD Europe addicted to gas?



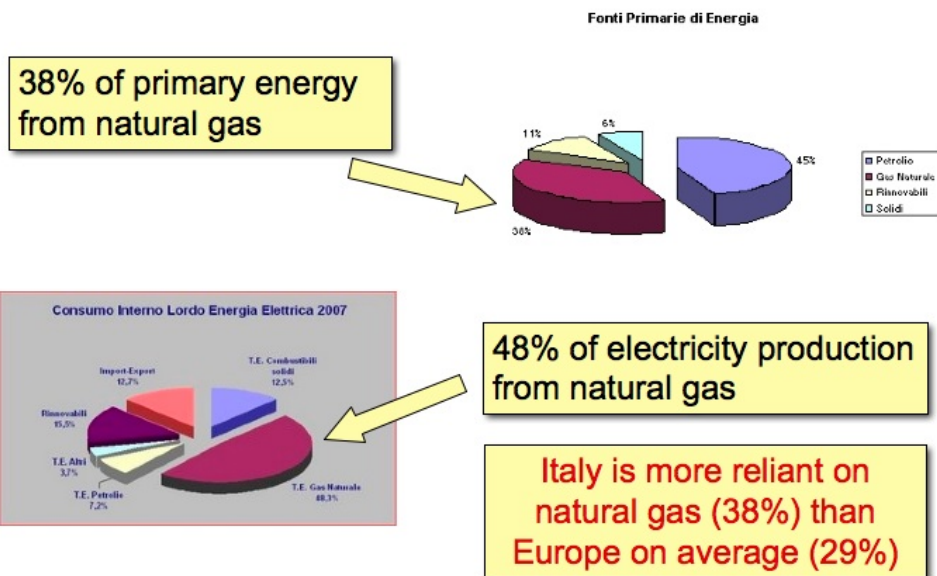
Demand for gas has increased 19 fold in 40 years.

- domestic heating
- power generation
- industry and commerce

In the last 40 years, Europe’s consumption of natural gas has increased 19 fold. I think this is really quite an astonishing chart showing how our use of and reliance upon natural gas for fuel has grown.

As we shall see later, this was made possible by rapid growth of natural gas production in the North Sea. This bounty whilst not yet exhausted is getting tired and is about to go into decline causing major problems for European gas and energy security.

## Italy natural gas consumption

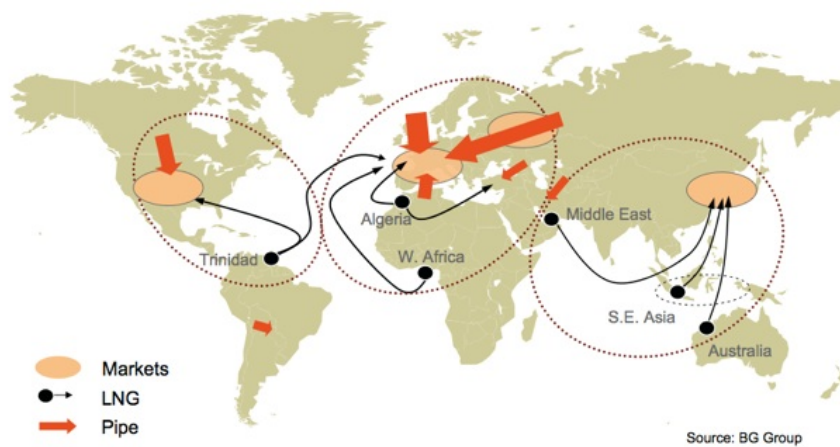


Since we are in Italy, it is worth spending a moment looking at Italy's reliance on natural gas. Italy does produce some gas - 11 bcm in 2006 and falling. This is compared with consumption of 77 bcm. So Italy like all other OECD European states, apart from Norway and The Netherlands is dependent upon imported gas.

Natural gas makes up 38% of Italy's primary energy consumption and 48% of electricity generation.

Italy is more reliant on imported natural gas than most other European states – which is perhaps the reason Ugo asked me to give this talk ☺

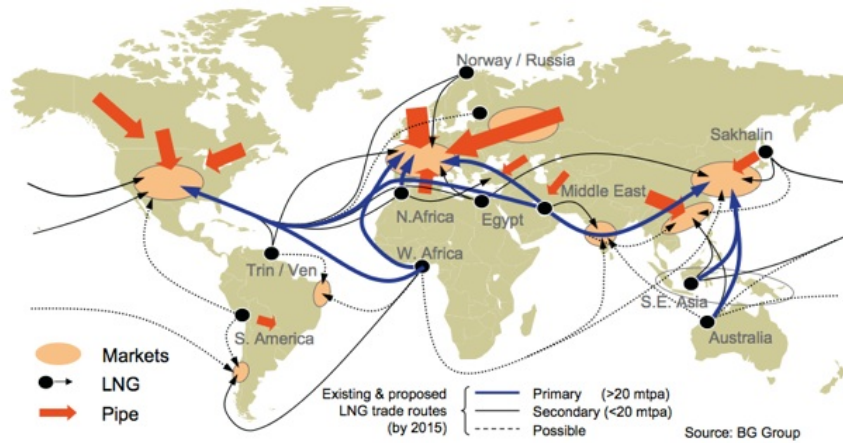
## Global gas trade - the recent past



Historically, gas markets have been regional with points of consumption close to supply linked mainly by pipelines – N America, Europe and Russia. The main exception has been Japan / S Korea that has a long established LNG supply train.

This and the following slide are borrowed from this [presentation by BG Group](#) (large pdf).

## Global gas the near future




This picture is in the process of changing. Emergence of new markets for natural gas made possible by growth in LNG. S America, India, China and the Middle East – not shown on this map.

LNG provides much greater interconnectivity of markets, greater competition and is rapidly leading to harmonisation of prices.

Not shown on this map is the declining production in traditional sources of supply in N America and Europe.



## Characteristics of the evolving global gas market



- Number of markets & demand are increasing
- Supplies adjacent to the historic markets are in decline
- Linking new supplies to markets requires Liquefied Natural Gas - LNG
- Supply bottlenecks - Straits of Hormuz, Suez, Straits of Malacca
- Competition for supplies. Global gas prices already showing harmonisation.



This simplified map shows the principal supplies to Europe. These correlate with security of supply and understanding of that security.

Indigenous supplies are most secure and we know most about them

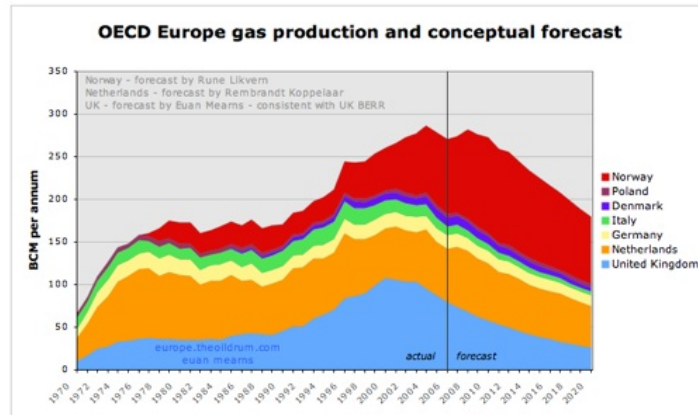
Adjacent supplies are less secure and are less well understood

LNG supplies are fairly well understood – but we don't know how the market will allocate supply to Europe and those supplies transported by ship are least secure.

# OECD Europe Indigenous gas production + forecast

- 3 important countries
  - The UK - **peak 2001**
  - The Netherlands - **peak 1975**
  - Norway - **peak 2009?**

Production is likely past peak and is set to fall.



The main features:

Three important countries: The UK, The Netherlands and Norway

The UK gas production peaked in 2001 and is declining at 8.5% per annum – there is little disagreement on this point – the UK BERR (government) agrees with this scenario. This is one of Europe’s biggest gas supply problems since the UK used to export a little gas and is now looking to import increasing amounts of gas every year. This is placing considerable strain on the whole European gas market.

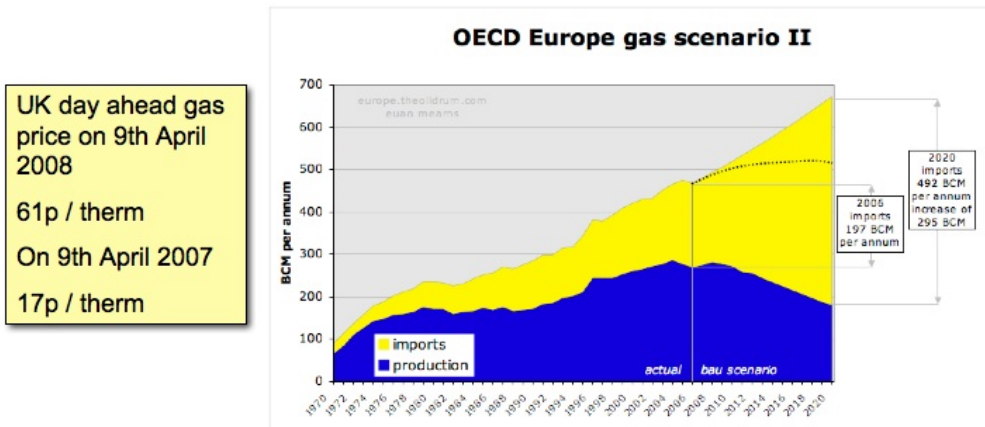
The Netherlands have had a carefully regulated gas industry with production in Groningen pegged by law. This has resulted in a very broad production plateau – a very sensible strategy. The offshore Holland gas production is now in decline (like the UK) and this will lead to slowly falling Dutch gas production.

Norway is at a crossroads. The production gas export system has recently been expanded to 120 BCM per annum with the addition of the Langeled pipeline linking the Ormen Lange Field to England (and to continental Europe). The two giant gas fields, Ormen Lange and Troll and can go on producing at a suppressed plateau for many decades. But many of the other North Sea gas fields are in decline. Especially the oil associated gas and the combined prognosis is that Norwegian gas production may peak next year – a forecast provided by Rune Likvern – an informal contributor to The Oil Drum. This has been confirmed by informal releases from the Norwegian Government and the peaking of Norwegian gas will have profound effect upon European gas security.

In summary, the prognosis for indigenous European gas production is quite bleak. Peak was probably in 2004 and in future we can look forward to relentless declines.

# OECD Europe business as usual gas import scenario

- Gas imports were 197 bcm in 2006
- May grow to 492 bcm by 2020 under business as usual (bau)
- **Price and scarcity will likely hinder that outcome.**



If we combine this European production forecast with a consumption and import model projecting historic growth in demand into the future we get a picture of rapidly expanding gas imports.

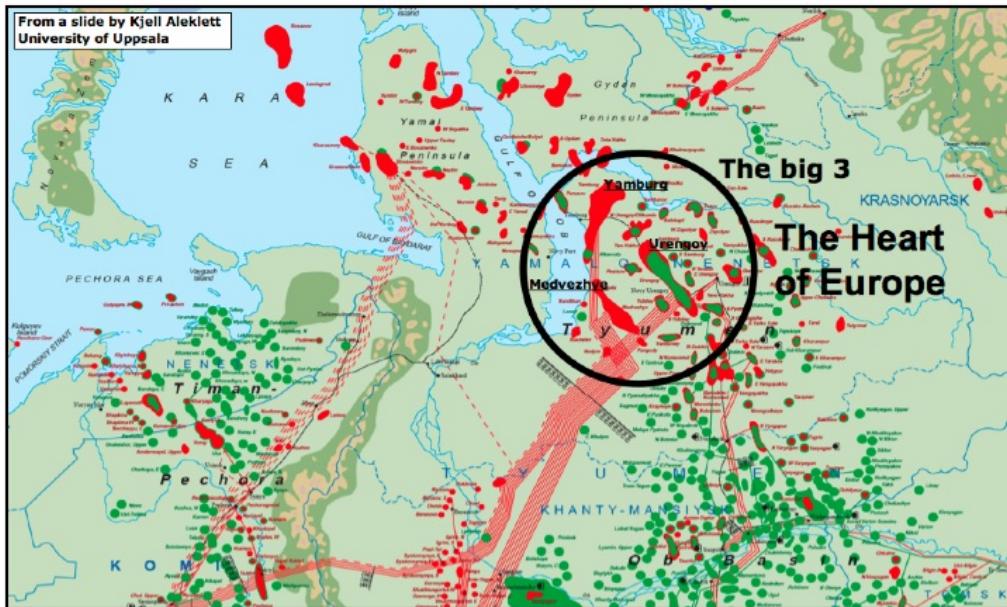
In 2006 we imported 197 BCM natural gas and this model scenario projects that growing to 492 BCM by 2020 – that’s only 12 years away.

Where will all that new supply come from?

We are already seeing signs of high price rationing demand and I don’t believe this scenario can or will unfold. When I made this chart I sketched in this line indicating demand curtailment – and I will try to quantifying this at a later stage.



# Russia gas production

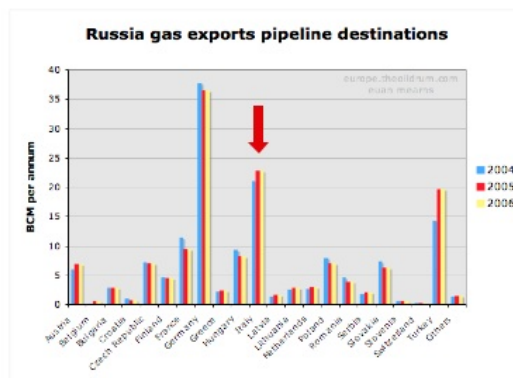


As this map shows Russia has many gas fields in West Siberia and the Yamal peninsula indicated here in red. Historic production was dominated by 3 supergiants – Yamburg, Urengoy and Medvezhye. Since 1970, these three fields provided the bulk of Russian gas production – powering the Soviet Union and Western Europe.

These three supergiants are now in decline – this is no secret – the data has been published.

## Russian gas export market

- **Many countries import Russian Gas**
  - France, Germany, **Italy** and Turkey are largest importers
- **Supply shortfalls in these countries will increase competition for gas else where.**



OECD Europe current consumption of Russian Gas = 115BCM per annum.

- Nord-stream = 55 BCM per annum
- South-stream = 30 BCM per annum

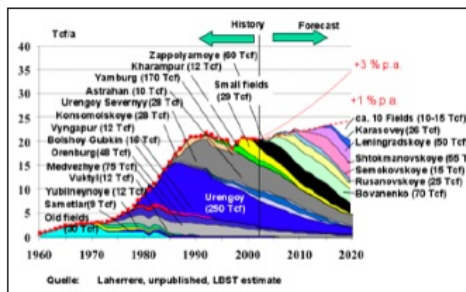
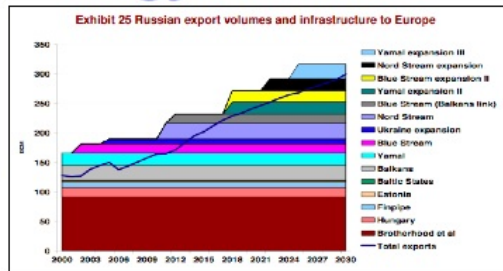
In 2006 Russia exported 115 billion cubic meters gas to Europe. The three most important importing countries are Germany, Italy and Turkey.

New pipelines planned will provide 88 BCM new import infrastructure. But will this bring new gas, or old gas via a new route? This is one of the most important questions to answer.

## Russian gas production forecast methodology

- **Global Insight / BERR: base forecasts on infrastructure, not gas supply.**
- **Forecast export growth from 100 to 300 BCM per annum by 2030**

**New pipelines may provide greater security of supply but alone do not provide new gas.**



- **Forecast from Jean Laherrere based on gas production and reservoir deliverability**
- **Supergiant gas fields are in decline**
- **New fields may at best compensate for decline**
- **North Stream may not bring “new gas” to market**

These two charts show two very different pictures of Russian gas production forecasts.

The upper chart is based on existing and new pipelines from a forecast commissioned by the UK government. This shows export capacity doubling from 120 to 300 bcm per annum by 2030.

This is what the UK government wants to believe will happen?

The lower chart is compiled by Jean Laherrere and is based on decline modelling of existing fields with new field developments stacked upon the heritage assets of Yamburg Urengoy and Medvezhy.

This shows fairly flat Russian gas production forward to 2020 – this has a more realistic feel.

# Nord-stream

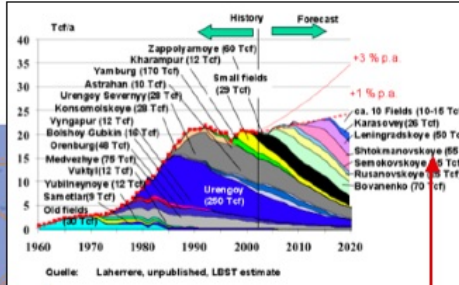
New pipelines provide greater security - by-passing Ukraine. But do they provide additional production volumes?



<http://www.nord-stream.com/index.php>



Yuzhno-Russkoye 700 BCM reserves?  
28 years supply @ 25 BCM per annum.



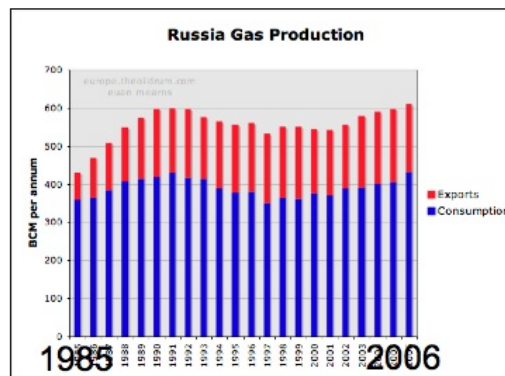
27.5+27.5 = 55 BCM per annum from  
 • Yuzhno-Russkoye and  
 • Shtokmanovskoye

Much hope has been placed in new pipelines being built from Russia. Nord-stream will produce gas from fields identified by Laherrero that will merely compensate for the decline from existing fields.

If this is correct then it will not bring “new gas” to Europe but will merely maintain existing production levels.

## Russia gas production and exports

- Russia uses over two thirds of domestic gas production and domestic consumption is rising
- Flat / falling production and rising consumption may hit exports
- 64% of Russian gas exports currently to OECD Europe (inferred)
- Other importers: Turkey, Ukraine, Belarus et al.
- Future importers: Japan and China?





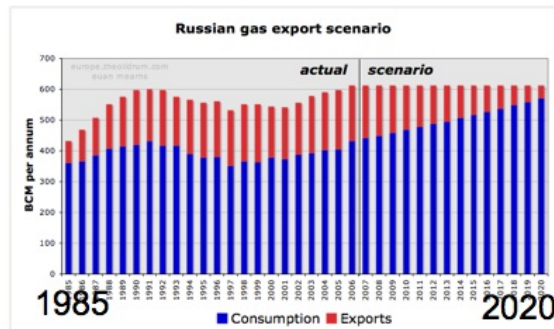
This is a very important slide. It shows that Russia consumes two thirds of its own gas production. It also shows that other countries import gas from Russia – notably Ukraine and Turkey.

Exports are very sensitive to any downturn in production or upturn in domestic consumption.

With the data we have it is near impossible to model these variables.

## Russian gas export scenario

- Russia exports 180 BCM per annum, 115 BCM per annum (64%) to OECD Europe
- Flat production and domestic consumption rising at 2% per annum will swallow Russian gas exports by 2020
- Russia should be encouraged to be more efficient in gas consumption (build many for CCGT)

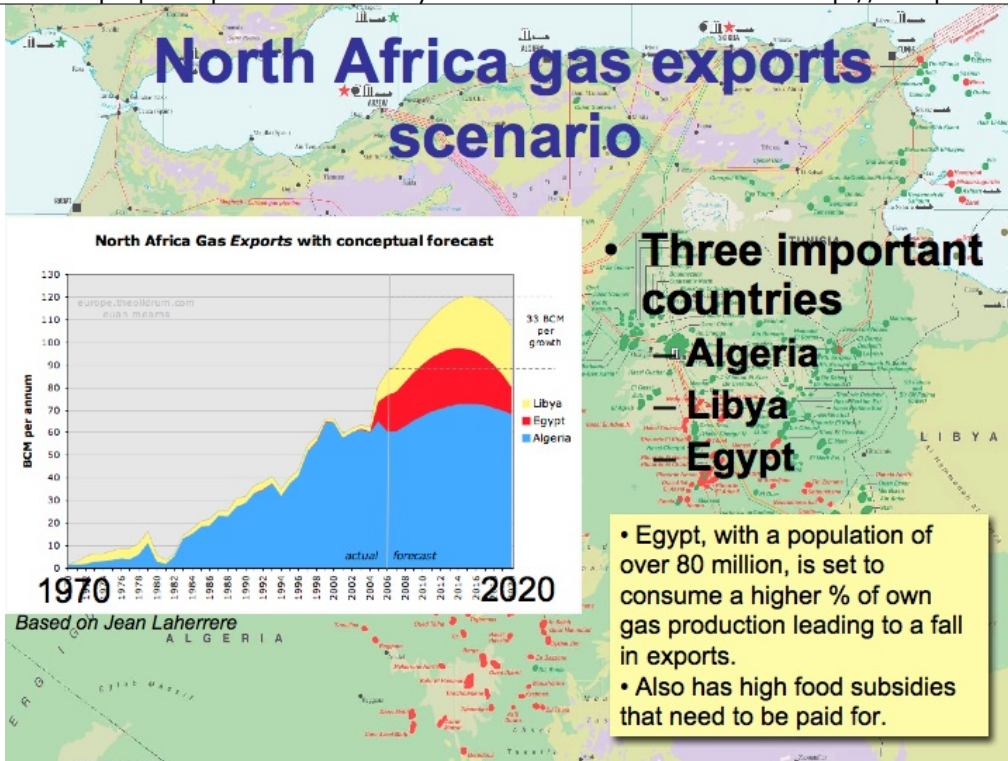


With flat production and a continued rise in Russian gas consumption, exports could fall dramatically between now and 2020.

How would these reduced exports be allocated.

I'd guess to the richest countries who can pay the highest price – perhaps via the new pipelines.





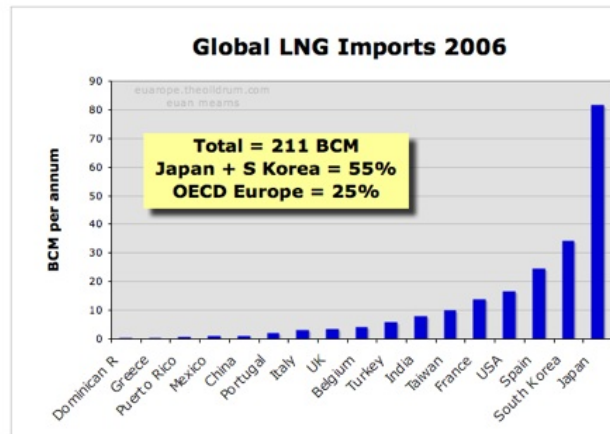
North Africa is already linked to Europe by pipelines, and production and exports from Libya and Egypt are expanding.

Most of N African gas production comes to Europe and this source of supply should continue to grow until about 2016.

But note that Egypt is forecast to consume more and more of its own gas production that will lead to a peak and then decline in exports.

# Liquefied Natural Gas - LNG

- Demand for LNG is rising everywhere



We now move on to look at how the LNG market might evolve.

The market is currently dominated by Japan and S Korea.

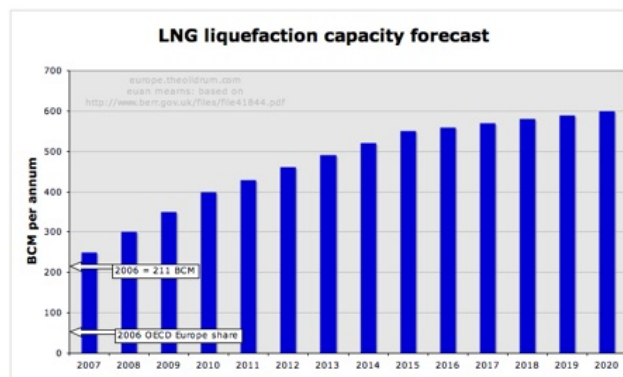
Total production in 2006 was 211 BCM and Europe had 25% share of that market.

How will future LNG supplies be allocated? That's a difficult question to answer.

## Global LNG supply forecast

Growth from 211 BCM in 2006 to 600 BCM in 2020

- LNG liquefaction capacity is set to grow.
- Current OECD Europe share of import market = 25%
- How will this market share evolve?
- Global re-gas capacity is about double liquefaction capacity - set to fall to 1.7 over capacity by 2020



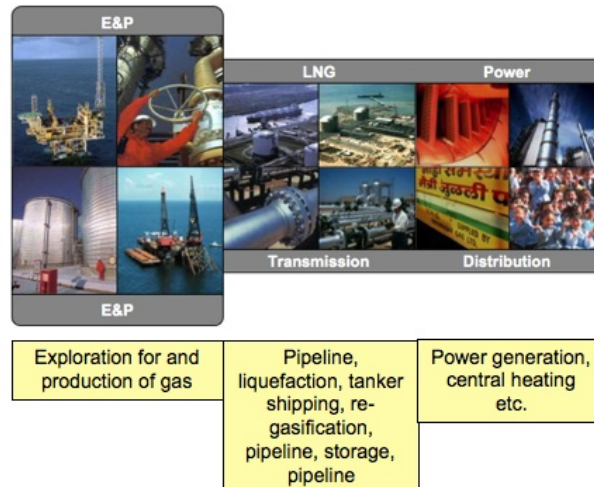
Based on Global Insight / BERR report 2007

This is a forecast of how LNG supply is forecast to grow, prepared on behalf of the UK government.

It should grow from 211 BCM in 2006 to 600 BCM in 2020.

## The LNG Supply Chain

Strategy  
Business model



The LNG supply chain is long and complex. Note that we must contemplate storing LNG during summer by re-injecting into depleted gas reservoirs.

# Tanker traffic bottlenecks

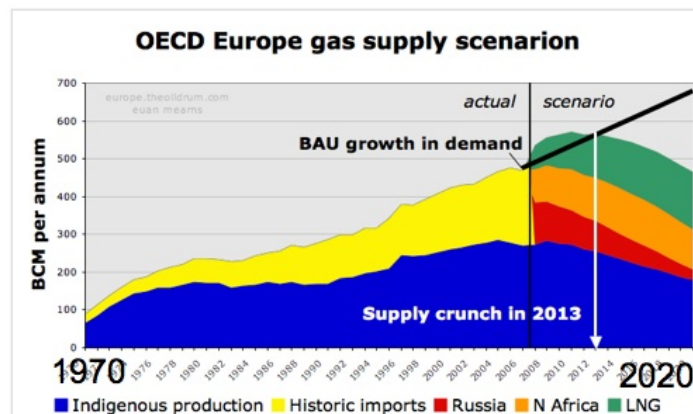


LNG tankers are also vulnerable in three notorious tanker bottlenecks in Hormuz, Suez and Malacca. The malicious actions of a very few individuals there could seriously disrupt gas supplies to Europe – disrupting industry, commerce and electrical power generation.

## European Gas supply scenario

### Assumptions

- Russian production flat, domestic consumption rising at 2% per annum, OECD Europe remains at 64% of total Russian gas exports.
- 100% N African exports come to OECD Europe.
- 25% of global LNG exports



So how does all this information and speculation add up?



By making the assumptions indicated, a supply shortfall is indicated by 2013. If this were to happen, then Europe would have to learn to live with less.

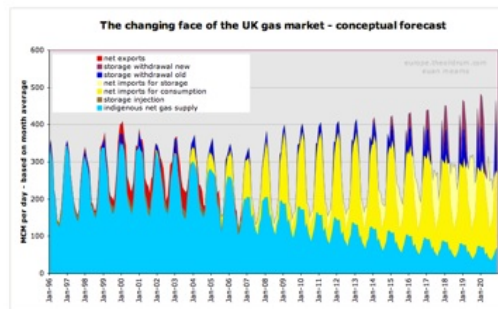
This is subject to many uncertainties that could work either way – the shortfall could occur sooner or later.

The main uncertainties are:

- Norwegian gas production
- Russian gas production and export forecasts. The share OECD Europe gets of these exports.
- The allocation of LNG exports.

## Important points not covered

- Annual cycle in natural gas demand
- Consumption focused in N hemisphere
- Gas storage



In developing gas supply scenarios it is also very important to be aware of the cyclic seasonal nature of gas demand.

The fact that most demand is centred on the N Hemisphere creates an annual global demand spike

There is a need for increased gas storage throughout Europe in order to smooth out that seasonality. This may also smooth out seasonal pricing with consequences for the gas storage industries.



## Main conclusions

- OECD Europe may face a gas supply crunch around 2013
- With time the security of supply will fall mainly due to growing dependency on LNG
- New infrastructure: re-gas capacity and pipelines  $\neq$  more gas.
- New pipelines may enhance security of supply
- How will global supplies be allocated? If this is done by price alone, then poor people and poorer countries may have to go without. This may create unpredictable security issues
- Salvation lies in **energy efficiency**
- There are many uncertainties

Further reading on The Oil Drum

[The European Gas Market](#) by Euan Mearns.

[Daddy, will the lights be on at Christmas?](#) by Euan Mearns.

[The ASPO-Italy conference in Torino](#) by Ugo Bardi.



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