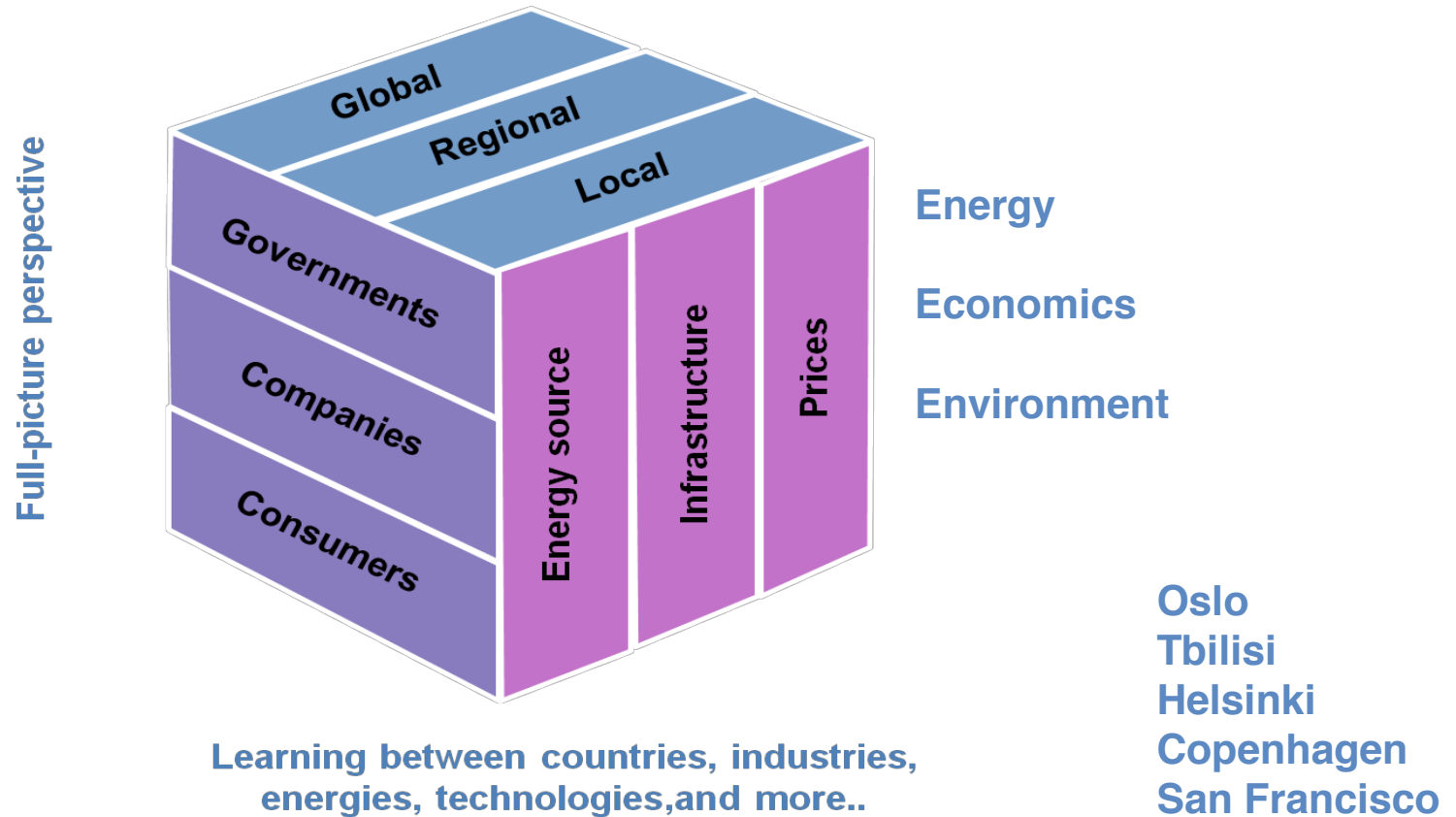




What are the options for Barents Sea gas? And which solution is best for the future?

Karen Sund
25th January 2012
Tromsø, Norway

Sund Energy helps navigate into the energy future...



...by understanding the full picture of stakeholders

Agenda

Key issues

Norwegian perspective

Russian perspective

The Market

New thought: Sooner and better for more?

There are many challenges for Barents Sea gas...

There are large resources of gas in the Barents Sea

- All are far away from the markets we normally aim for
 - Transportation costs could reduce profits

Markets are more uncertain than before

- Demand for gas could be higher or lower than today
 - Price, emission balance, cost of alternatives
- Supply could be plentiful and from new sources
 - US becoming exporter instead of importer – much “loose” LNG
 - Advent of unconventional gas in Europe – will impact use of gas and trade
- Prices are uncertain and could be a dilemma
 - High price regime will reduce the demand and have less need for Arctic gas
 - Low price regime could increase demand but give less netback to Arctic
- Gas is generic/commodity, more like oil in the future
 - Less separation between suppliers/countries, more focus on price
 - Less payability for Norwegian gas in a Norwegian pipeline than before

...and some opportunities that should not be dismissed

Local markets could develop

- Arctic region expecting growth in industry, minerals, energy
- Shipping in the Arctic could well want LNG as fuel
 - Much better for the environment (climate, pollutants to air, no oil spills)
 - Higher payability for gas as LNG – better than pipeline gas to spot markets

Rather than parallel, competing solutions, cooperation could win

- Sharing joint solutions give more choices to all
 - Could allow for pipeline, LNG, local industry and LNG to ships
- Lower costs for all and much higher upside for all
 - Economies of scale + hedge if one of options is less attractive

So, being stuck with a single option could be scary

- Especially if it turns out to be less attractive than expected
- Let's avoid regretting decisions in the future based on the past!

What does the EU want?

Affordable and available energy

- A joint system will reduce costs and improve security of supply
 - Competing systems could give negative netbacks and stranded assets
- A transport route north of Russia for better connections to Asia
 - Preferably without oil spills and high climate emissions

Energy mix that is clean enough

- Difficult to assess relative environmentalism
 - Nuclear vs climate vs pollutants vs costs
- Price will matter in this picture – as will future voters – complex!



Perhaps we should look at the bigger picture?

Polar expeditions

Growing interest

Fish

New shipping routes

Diplomacy

Oil & gas

Climate research

**Minerals/
rare earths**

Geopolitics



Source: International Boundaries Research Unit

Arctic gas – many new issues at once!

A generation ago, gas in the arctic was seen as stranded

- Little or no access, limited market and payability, coal better?

Access to the arctic has improved with less ice

- Possible to move into new areas and transport via new routes

Still not easy, but other developments, too

- Technology has improved – safer in deep water hostile environment
- Discipline has improved with stricter procedures
- Market prefers lower carbon fuels than before
- Transport by LNG more available than before

Many countries come together in the North – time to cooperate?

- Russia, US, Canada, Greenland, Norway...

Many new developments – synergy or competition?

Gas developments are growing in the Arctic, and several as LNG:

Aiming for Asian markets:

- North Slope, Alaska: Long delayed decision on pipeline – now LNG is possible and preferred solution
- Sakhalin and Vladivostok: Expanding LNG

Even the unexpected:

- Australia is growing LNG exports rapidly, partly from unconventional
- US could export profitably, even from East coast via Panama, to Asia

This will compete with other sources, such as Middle East, that may choose European markets...

So, what will large, global players do?

Total, Statoil, Gazprom, ExxonMobil, ConocoPhillips etc

- Different views, alternatives and logic in markets!
- Some more comfortable to adapt, others more stiff...

Best answer for Barents Sea gas will partly depend on the field developers

Time to take off blinkers and enter the future?

Traditional assumptions that many still use:

- Gas markets will grow steadily with much new capacity in power
- Norway, Algeria, Russia compete for gas markets in the EU
- Long term sales contracts are needed for infrastructure
- Exporters should produce and transport at base load
- Local sales in Norway are not attractive
- When a pipeline is built it will be used



This could easily result in the following scenario

- Little or no focus on domestic sales or LNG to ships
- Shtokman builds a pipeline to Nord Stream – in 5 years
- Norway waits for resources then builds a pipeline – in >10 years
- Competing pipelines result in lower prices and lower netbacks
- Less use of gas in the region, less income to gas, more emissions

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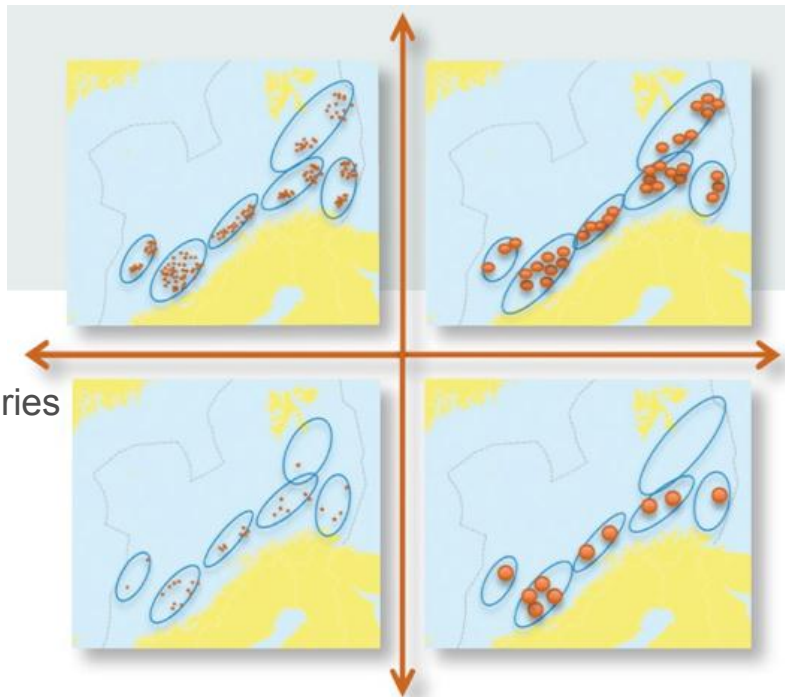
Norwegian resources: Potential with uncertainty

Resource picture – could be large or small, much gas, some oil

- Value in finding a solution that could allow early developments
 - Gas an important element here

NPD has made scenarios

More than expected



Large discoveries

Less than expected

Source: NPD

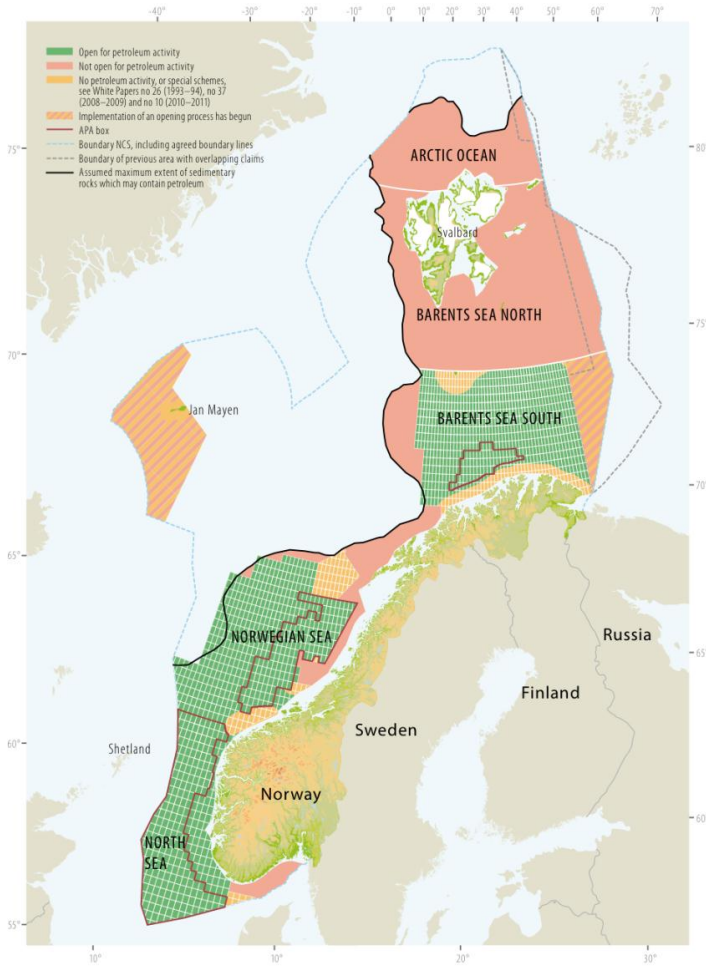


Figure 1.10 Status of petroleum activities on the NCS by area

New opportunities in Barents Sea – Norwegian focus

Barents Sea could hold 520 bcm

- Normally local market avoided
- Current plans to evacuate/export:
 - Pipeline to southern Norway
 - LNG to the global market
- Uncertain value of both – risk!
 - Mutually exclusive?

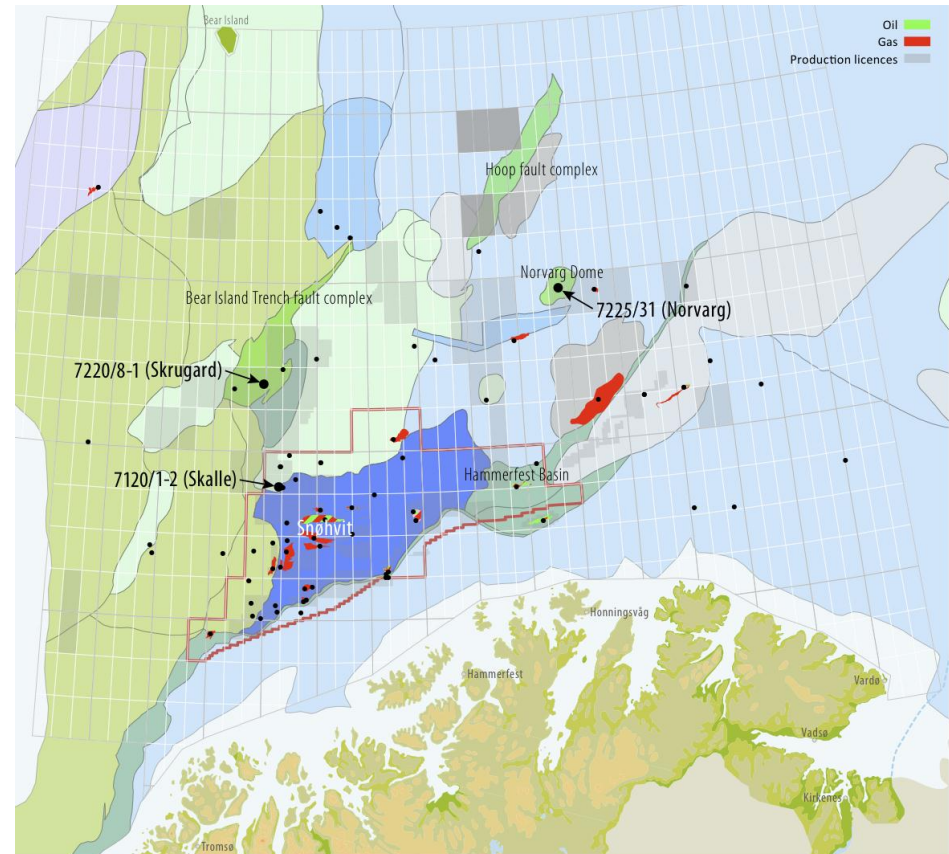
LNG: expand Melkøya 2018?

- More choice in markets
- Challenge: higher unit costs?

Pipeline: connect to south 2020?

- “Need to feed the South”
 - Build on existing systems
- Challenge: Could take a long time to “fill” or decide on?

Barents Sea South with discoveries to date – 2011



Source: NPD

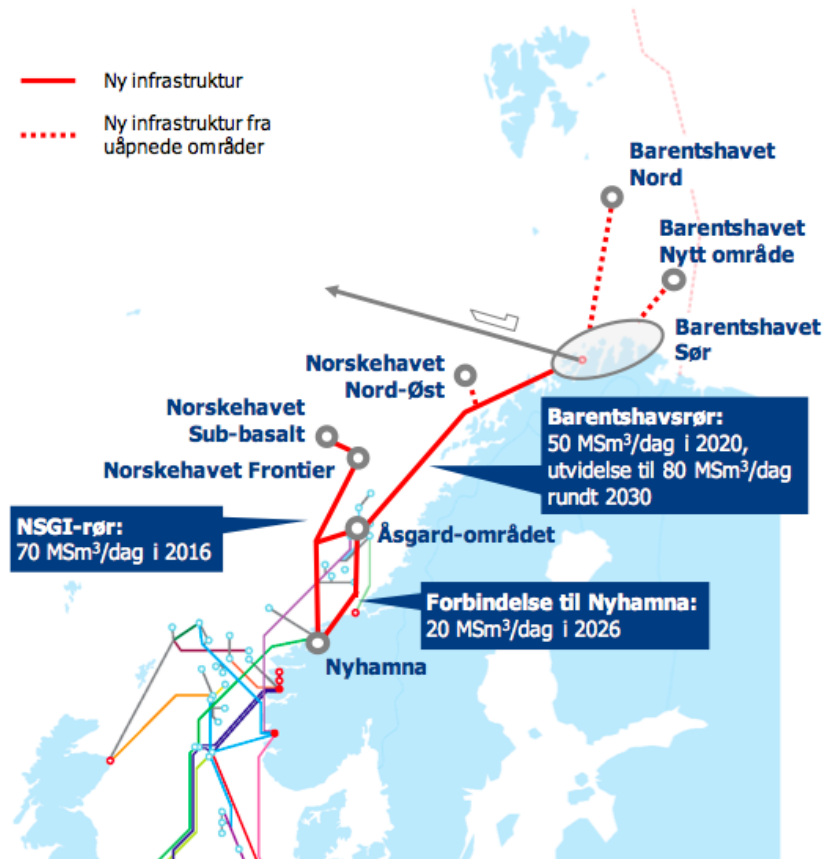
Gassco has studied a pipeline to connect the South of Norway



NCS2020

En studie av fremtidens gassinfrastruktur

Januar 2012

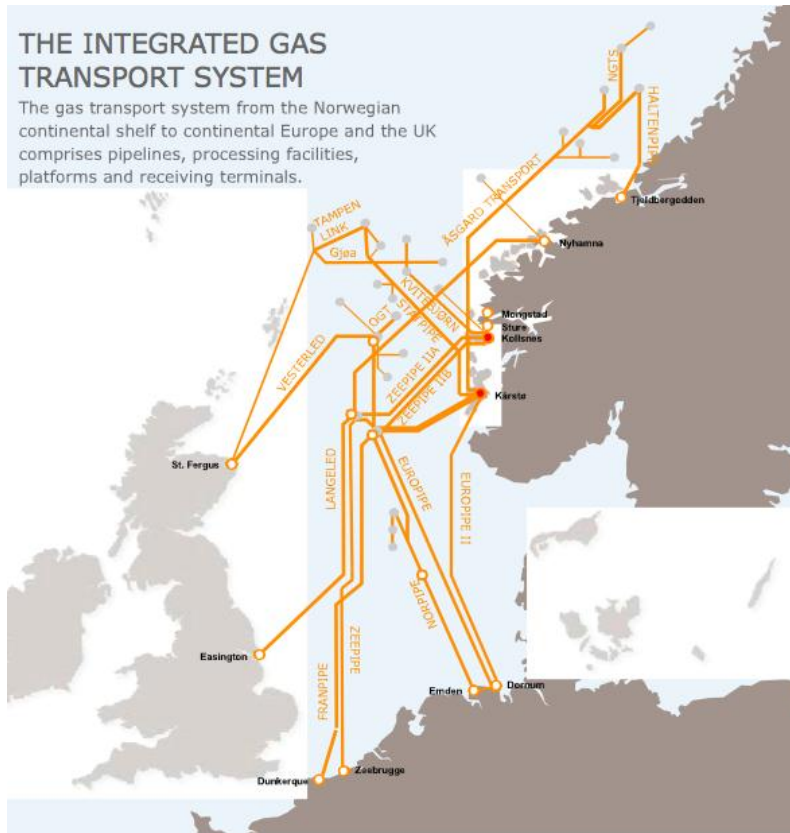


Do we need to feed the south with gas from the north?

	Gas bn scm		
	P 95	Expec	P 5
North Sea	140	280	465
Norwegian Sea	130	455	960
Barents Sea	80	520	1 460
Total	420	1 255	2 540

THE INTEGRATED GAS TRANSPORT SYSTEM

The gas transport system from the Norwegian continental shelf to continental Europe and the UK comprises pipelines, processing facilities, platforms and receiving terminals.



Source: Gassco

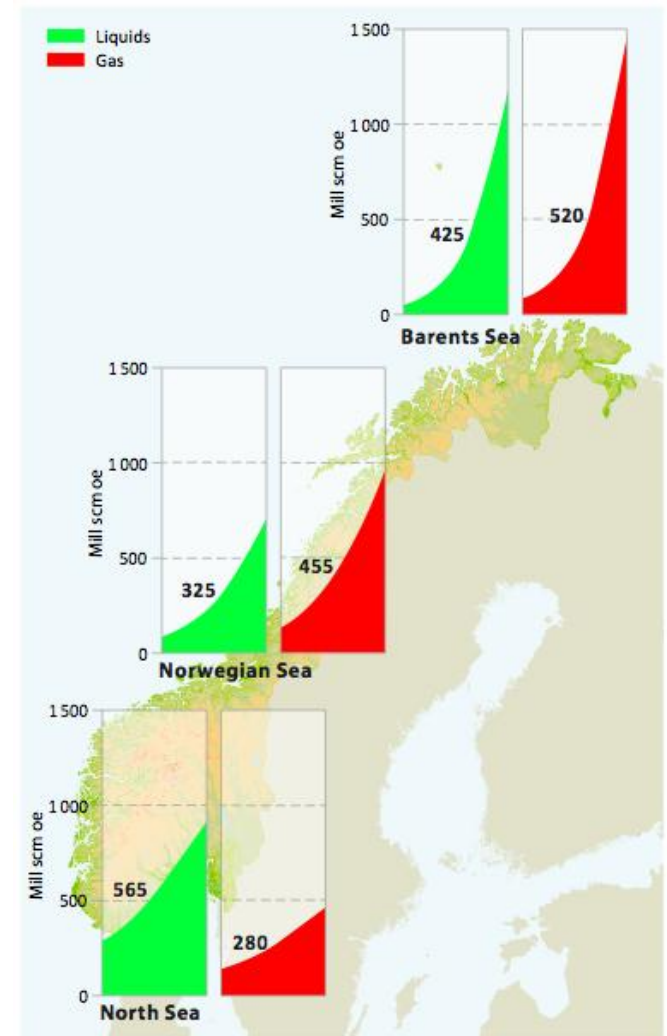


Figure 2.10 Distribution of expected undiscovered liquid and gas resources

Source: NPD

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The Market

New thought: Sooner and better for more?

Russia has a very large gas transport system



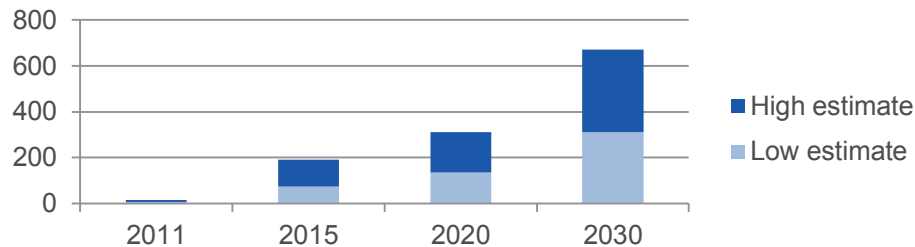
Source: Gazprom

Yamal is attracting pipeline and LNG investors

Gazprom:

- Forecast gas production from Yamal peninsula and nearby offshore (bcm)

Forecast Yamal gas production (bcm)



Novatek:

- Planning liquefied natural gas (LNG) plant at the Yuzho-Tambeiskoye deposit in Yamal: 1.26 tcm gas
- Partners: Total and Qatar?
 - Qatar energy minister (Nov 2011): "We are looking at a stake in Novatek, as well as in the Yamal project"



Yuzhno Russkoye is geared for Nord Stream

Gazprom & partners

- Wintershall
- E.ON Ruhrgas

Reserves >600 bcm

Production: 25 bcm/yr

- Key source field for Nord Stream (to Germany)
 - E.ON share: 6 bcm
- Later, Shtokman will also go into Nord Stream (and capacity will be added)



Shtokman discussions sound familiar

LNG or pipeline has been discussed

- Statoil and Total partners for LNG plant
- Current understanding:
Pipeline to Nord Stream first...

Production to grow in three phases

- Phase 1: 23.7 bcm of gas per year
- Phase 2: 47.4 bcm
- Phase 3: 71.1 bcm

Gazprom:

- “Gas production build-up in the field is envisaged following the results of the first two phases implementation, **provided that the target market environment is favourable and the gas demand is at the appropriate level**”



Source: Gazprom

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Norwegian gas markets are mainly in Europe today

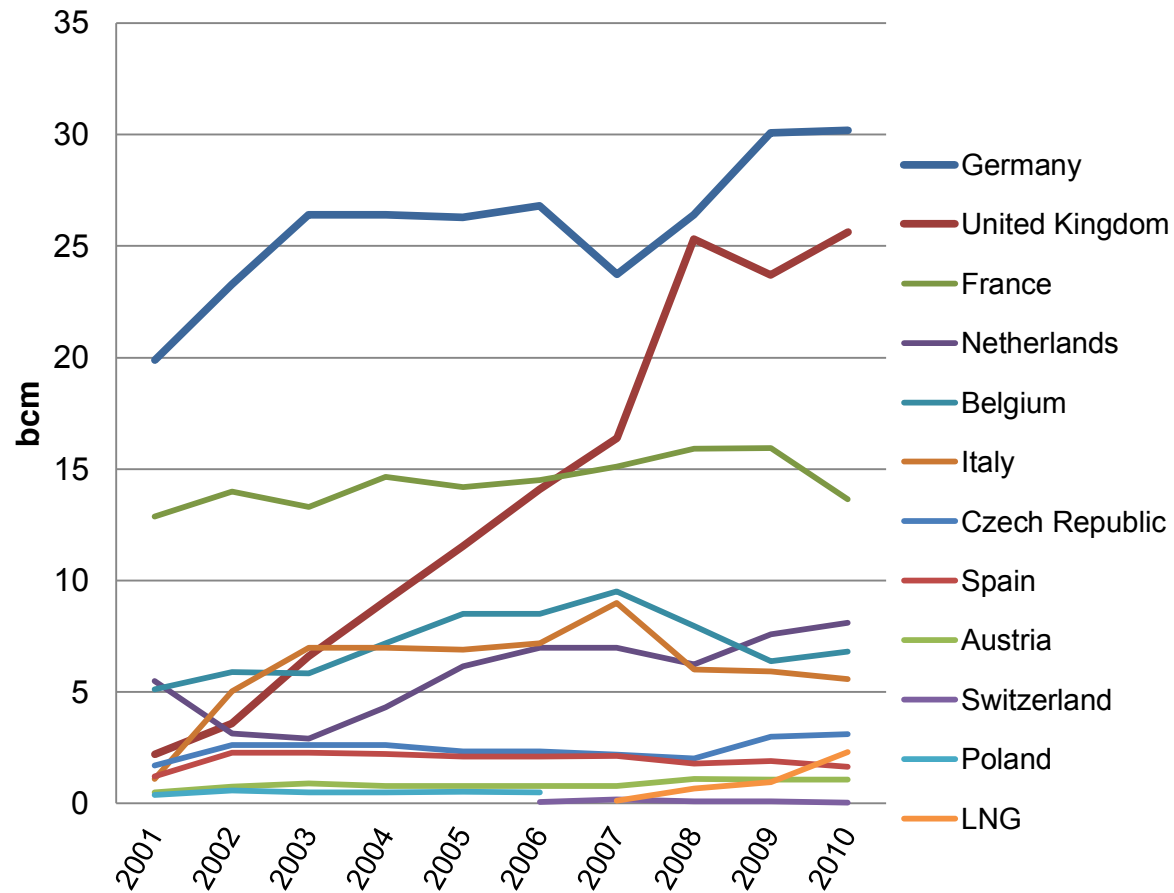
Germany:

- Always the largest buyer – now levelling out some
- Long term contracts first, now more spot
- Price matters

United Kingdom:

- Several years of very little imports (they had enough)
- Now most popular import market for its liquidity
- Frequently over supplied, giving lower prices...

Gas exports from Norway 2001- 2010



Data: BP Statistical Energy Review, 2002-2011

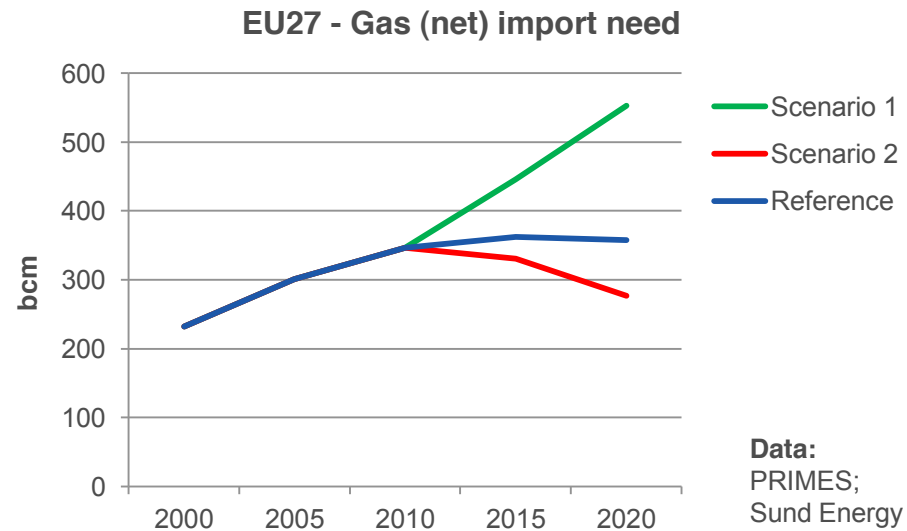
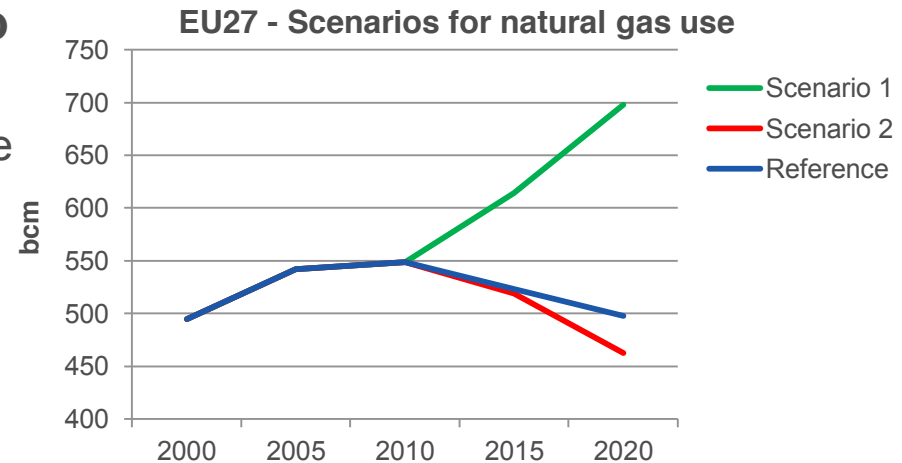
Future gas demand in EU 27 is uncertain

We have developed two scenarios to compare with EU projections

- Scenario 1: Affordable and available
 - More base load (than EU plans)
 - More use in transportation (trucks, ships and cars)
 - Much more imports needed
- Scenario 2: Managed supplies
 - Higher prices and lower volume
 - Mainly peak load in electricity
 - More investments in renewables
 - More domestic shale gas
 - Less imports needed

Risk for Barents Sea:

- Scenario 1: Too low netback?
- Scenario 2: Too low volume?



Data:
PRIMES;
Sund Energy

Political “right answers” change over time

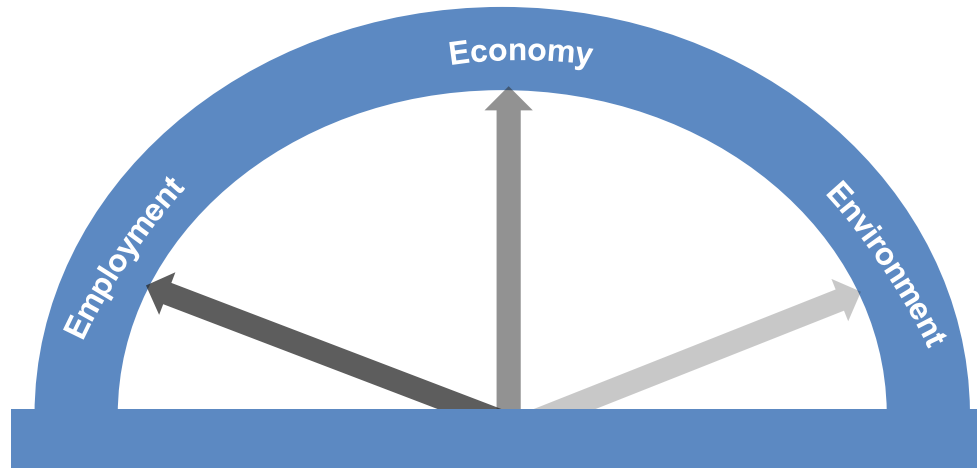


Illustration: Sund Energy

Top of mind and story now:

Fuel poverty/ recession

- Ensure households are warm
- Support businesses

Impact:

Gas may be OK, after all

- Especially if produced locally: Large shale potential in UK, Poland, France, Norway (!), and more

Top of mind and story 2007: 20-20-20

- Reduce demand with efficiency
- Reduce imports with renewables
- Reduce climate emissions by 20%, financed by less imports

Impact:

Less use of gas, especially imports

What happened?

- Gas became cheaper and abundant
- Nuclear less acceptable
- Wind a bit difficult

Money talks – even gas prices – in politics, too!

2007: EU perception was that there was not enough gas

- This meant that much of future imports would be LNG
 - LNG linked to oil was expected to be VERY expensive
- The region was also behind in climate commitments

20-20-20 was the solution!

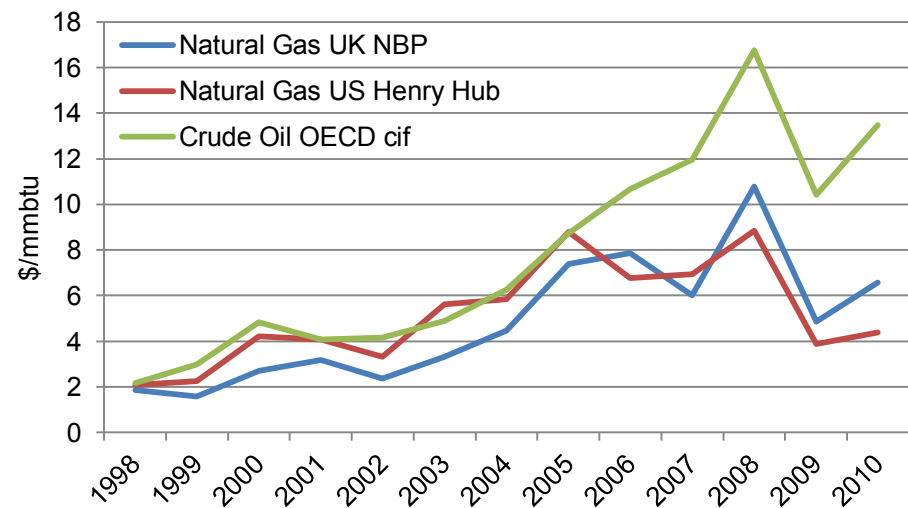
- More domestic energy that also was fossil free!
 - Wind, nuclear, ccs for coal
- To be financed by reduced imports
 - Oil and gas mainly

Now the world looks different

- Gas is cheaper
 - Clean and safe enough?
- Nuclear is less fun
- Governments less able to fund difficult greens
- Electricity prices at times too high

What do people really want?

Evolution of spot gas and oil prices

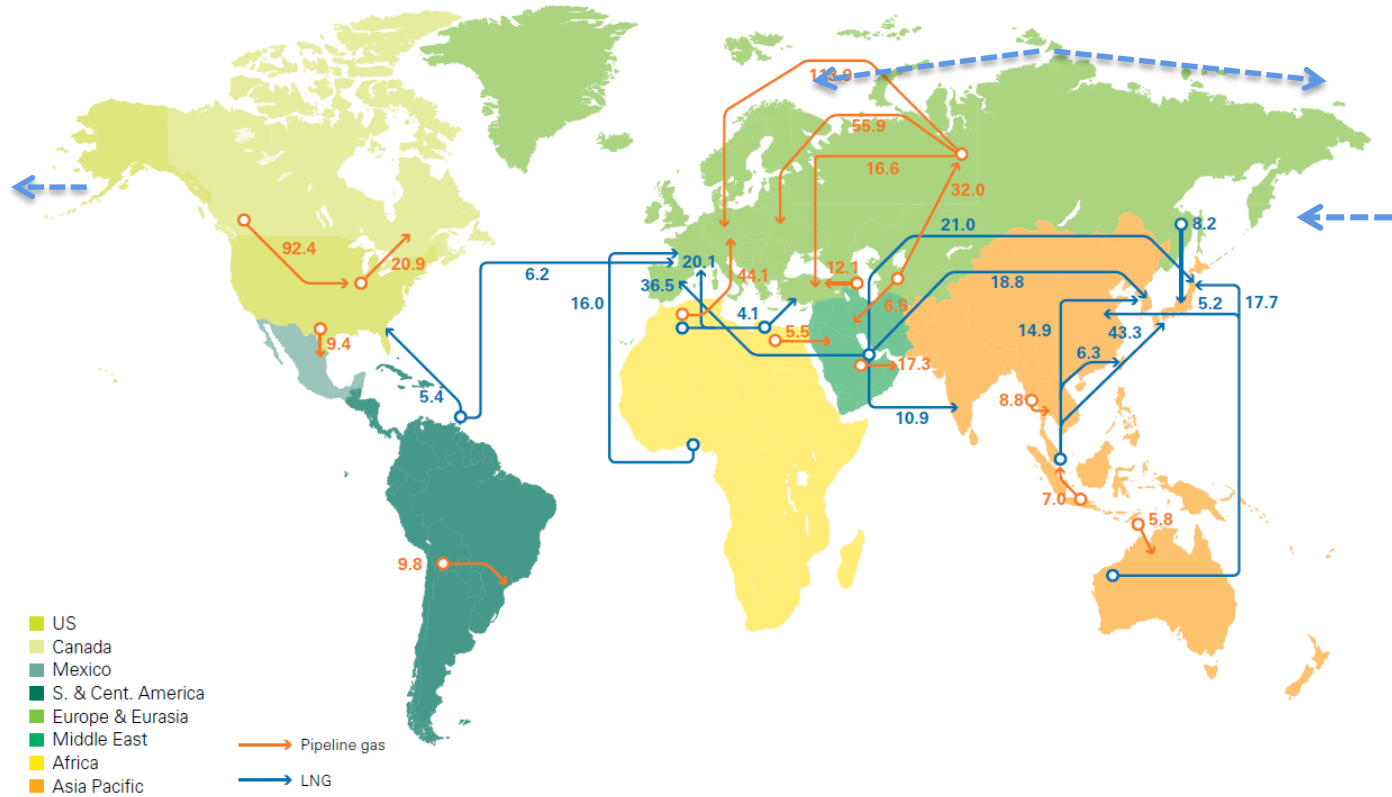


Source: BP Statistical Energy Review, 2011

Global gas is increasingly interconnected

Major trade movements

Trade flows worldwide (billion cubic metres)



...also in the Arctic

Source: BP Statistical Energy Review, 2011

Europe's shale resources may be very large...

Top 10 European shale gas resources*	Natural gas reserves** (Tcm)	Importers (✓)/ Exporters(X)	Shale gas resources* (Tcm)	Shale gas production by 2020***
Poland	0.16	✓	5.30	✓
France	0.01	✓	5.10	✓
Norway	2.04	X	2.35	?
Ukraine	1.10	✓	1.19	✓
Sweden	-	✓	1.16	?
Denmark	0.06	X	0.65	✓
UK	0.25	✓	0.57	✓
Netherlands	1.39	X	0.48	✓
Turkey	0.01	✓	0.42	✓
Germany	0.17	✓	0.23	✓

* Technically recoverable shale gas resources

** Proved conventional natural gas reserves

*** Sund Energy estimates

Source: World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States, April 2011

LNG has, finally, made gas a global commodity

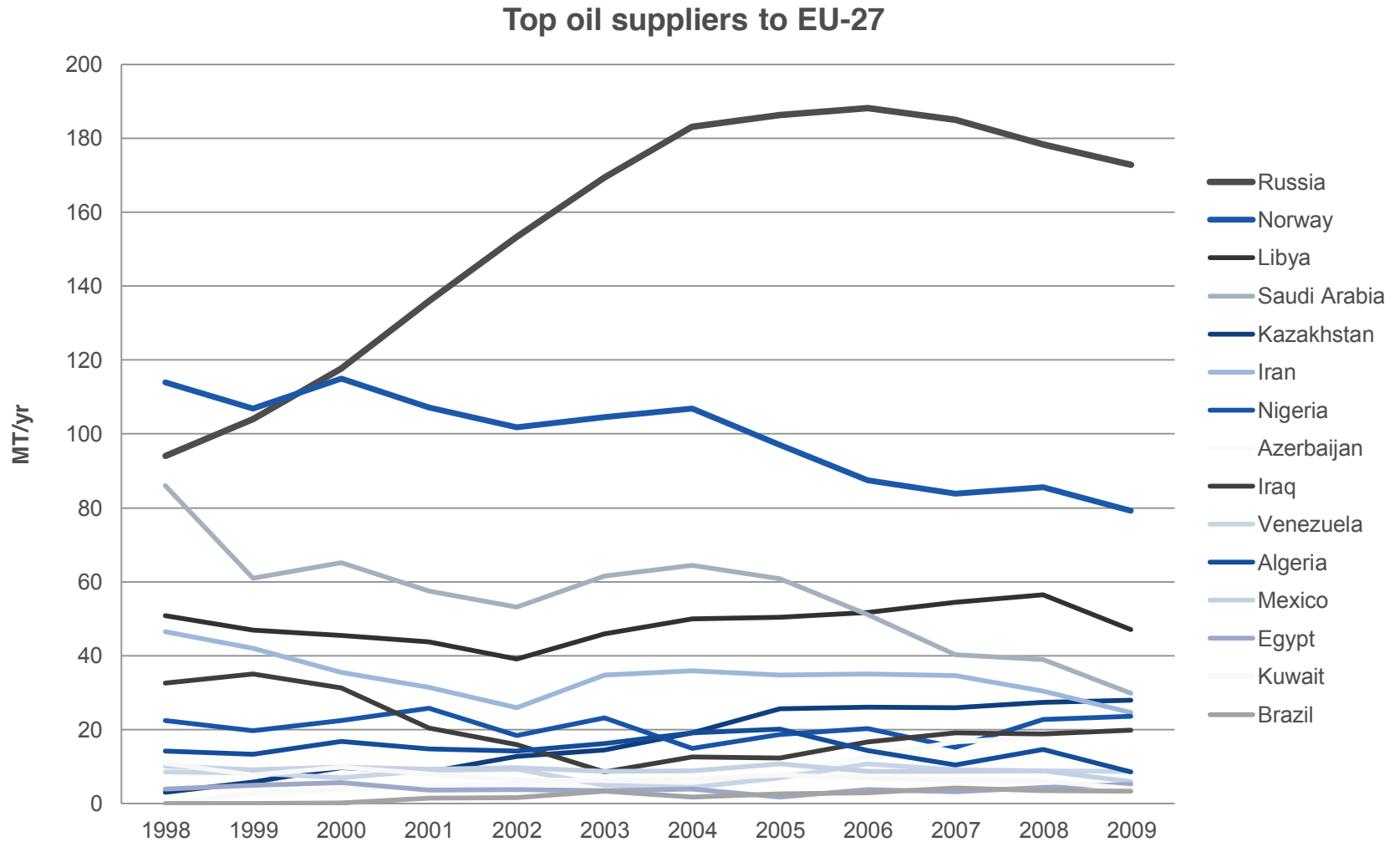
Long discussed issue – now happening

- LNG competes with pipeline gas
- Nationality of supplier matters less than price
- Regional prices are starting to harmonise as spreads are traded globally

What does this mean?

- Large LNG receiving capacity makes buyers able to buy “spare” LNG
 - This also puts pressure on incumbent supplier by introducing competition
 - Security of supply is improved as options to flow grow
 - New markets: Poland bought from Qatar, next Lithuania buying from US?
- All sellers of LNG can go to more markets
 - No geographic limits, it seems, as Peru supplies Spain and Norway Japan
 - More room for sellers to optimise – further harmonising prices
- Less separate markets than before – now more due to bottlenecks
 - US was long a high priced market, attracting much LNG
 - Now cancelling imports and growing exports – may reduce spreads

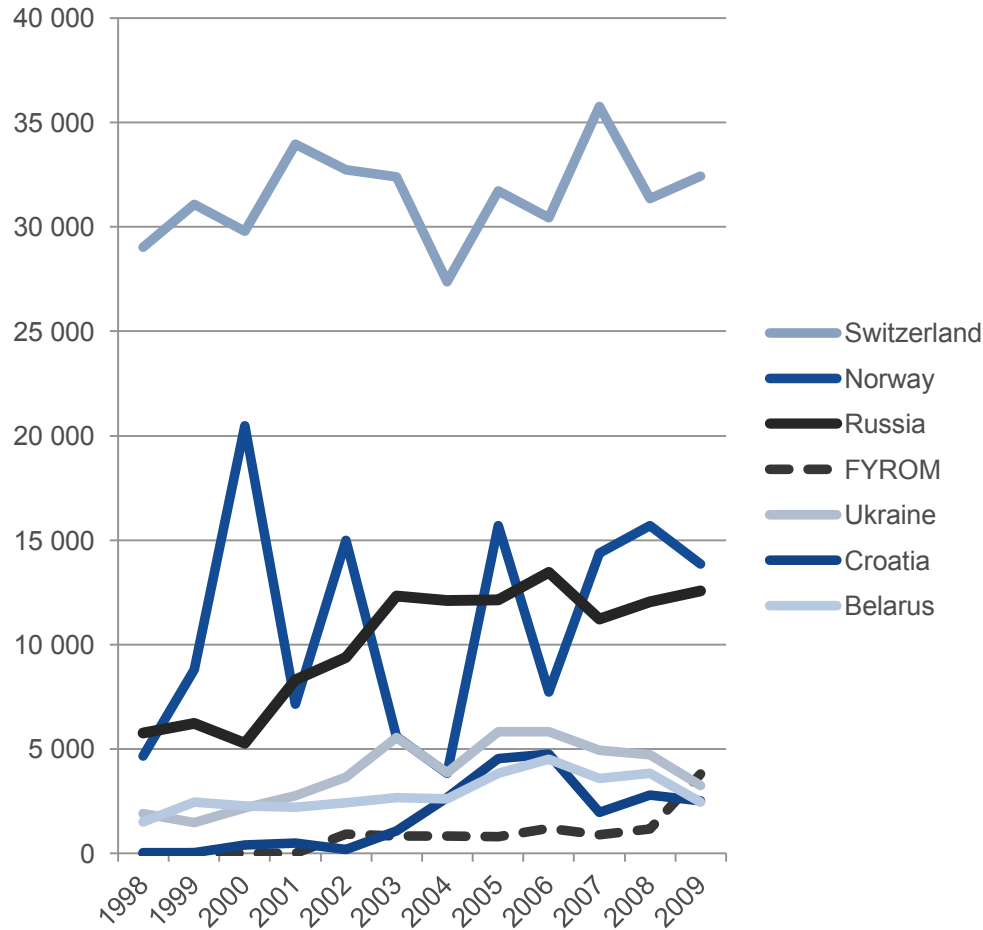
Oil imports, typical commodity, large Russian share



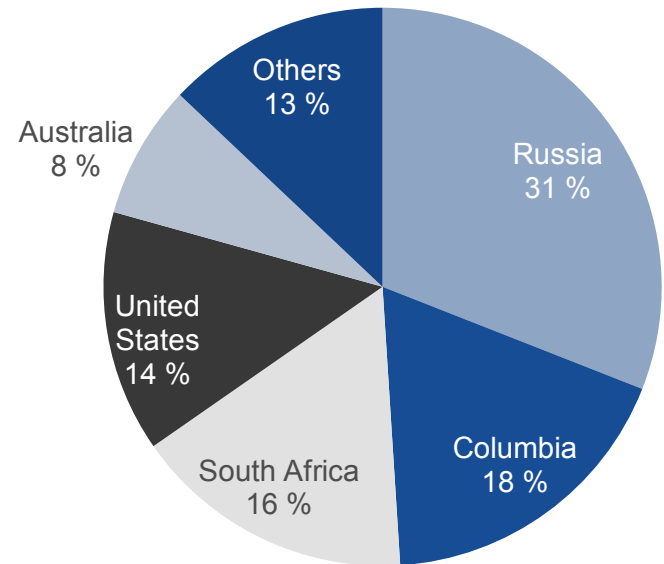
Data: Eurostat

Other energy commodities imported to Europe

Top electricity suppliers to EU27 (GWh)



Top coal suppliers to EU-27 (2009)



Data: Eurostat

Some gas is more valuable – time to differentiate?

Illustrative sketch: Future demand curve

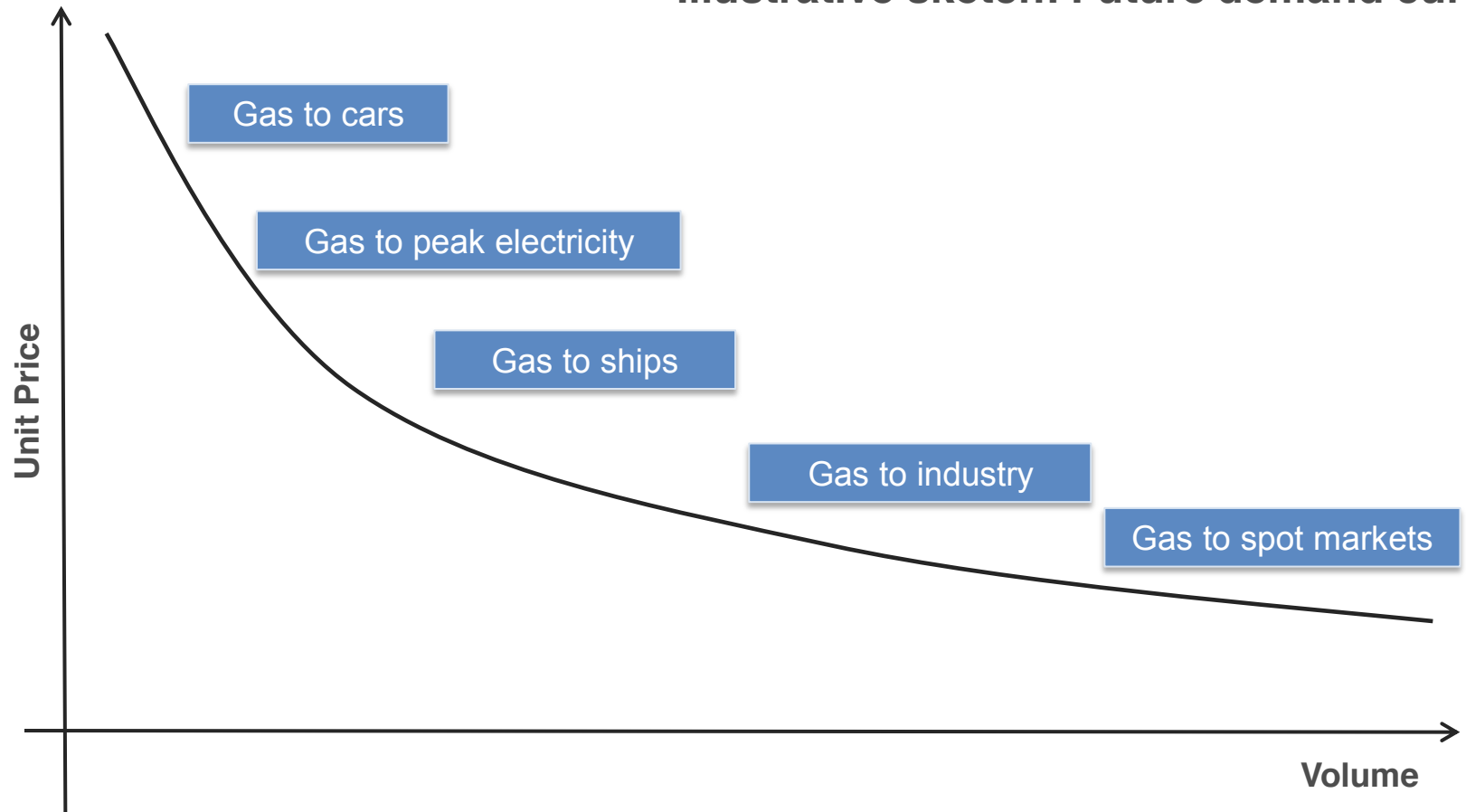


Illustration: Sund Energy

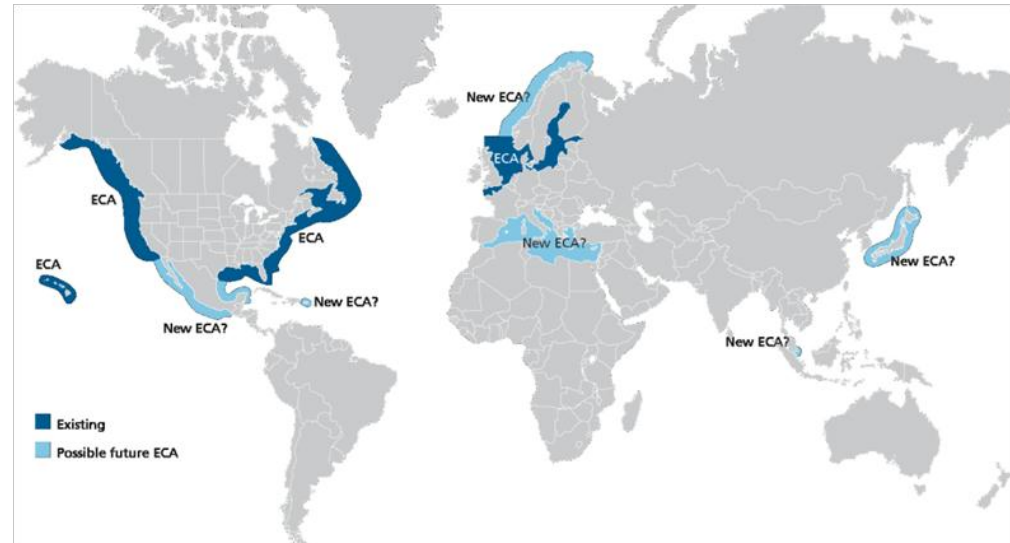
LNG to ships is growing quickly

Norway early mover:

- Primarily motivated by NO_x reductions
- Technology
- Fuelling

Now global:

- China
- US
- Europe



Increasingly motivated by economics

- Estimated volumes 2030;
65 MT LNG

Emissions Control Area - ECA

The Northern Route could be attractive for shipping

Ships are already using the route

- Saving time and energy between the Pacific and the Atlantic
- Great interest in supporting this on both sides
 - Even LNG to Japan from Snøhvit (summer 2012)

LNG is becoming an attractive fuel for ships

- Originally to reduce emissions of Nox and sulphur
- Increasingly to have the most economic fuel
 - Gas and be bought at prices below oil
- This could be a good market for gas
 - Added value of liquefaction

Early estimates of demand are 3-5 bcm for the Nordic/ Baltic region in 2020

- Could be significantly higher with more transport on the Northern Route

More minerals with a better energy situation?

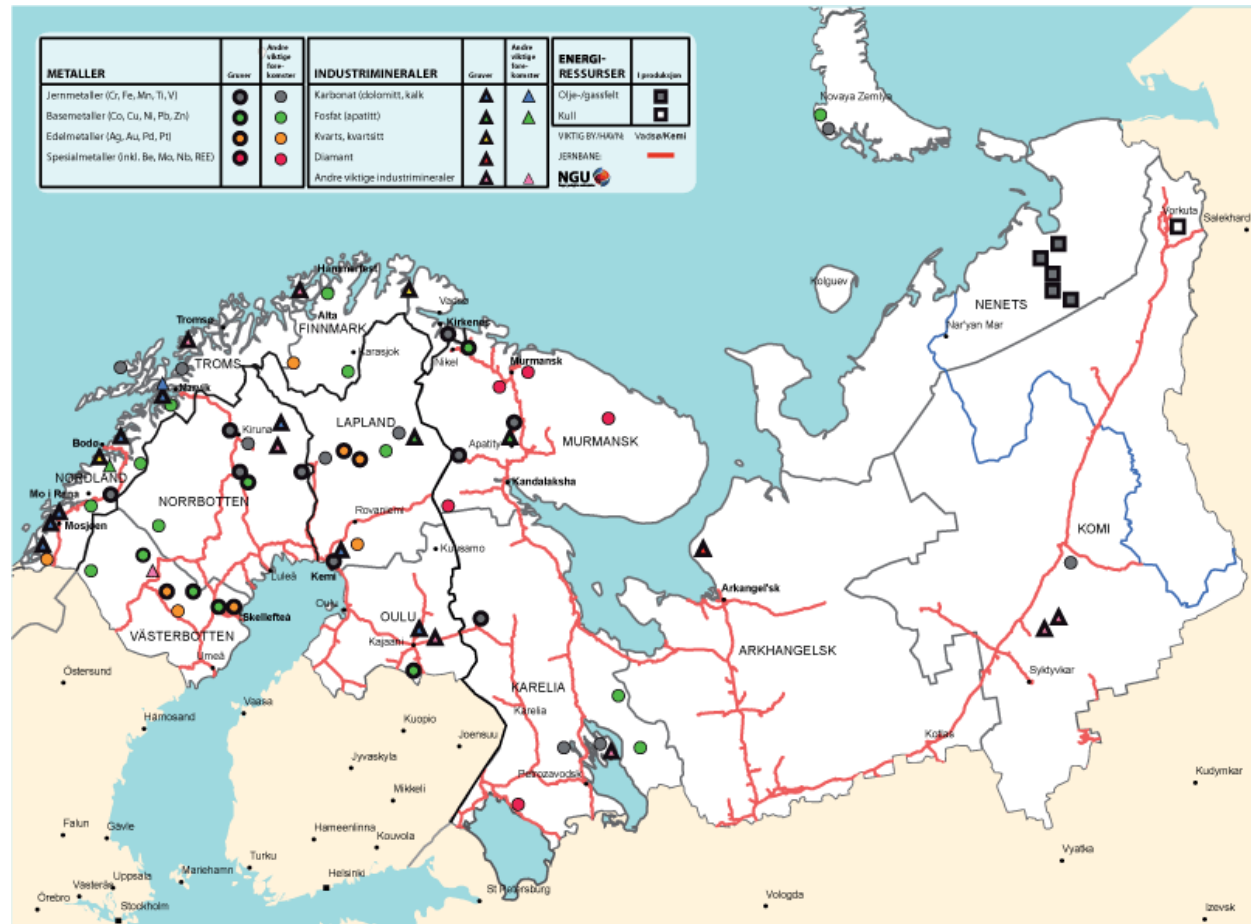
Much optimism around future mining opportunities

- Will need energy
- Could be power or gas

Also other power discussions on infrastructure

Finally: Shipping

- Could be large volume



Source: GeoNor/MFA

Prices and netbacks are difficult and vary

Today, local markets pay double EU prices for LPG or LNG

- Transportation costs could vary greatly – depending on size and location of future consumers
- Still cost plus or oil link...

The export markets have spot markets for new gas

- More gas could lower prices
- Transportation costs increase with distance, load factor and uncertainty
- Most alternative sources are closer

Netback: Price less transport

Illustrative sketch: Netbacks

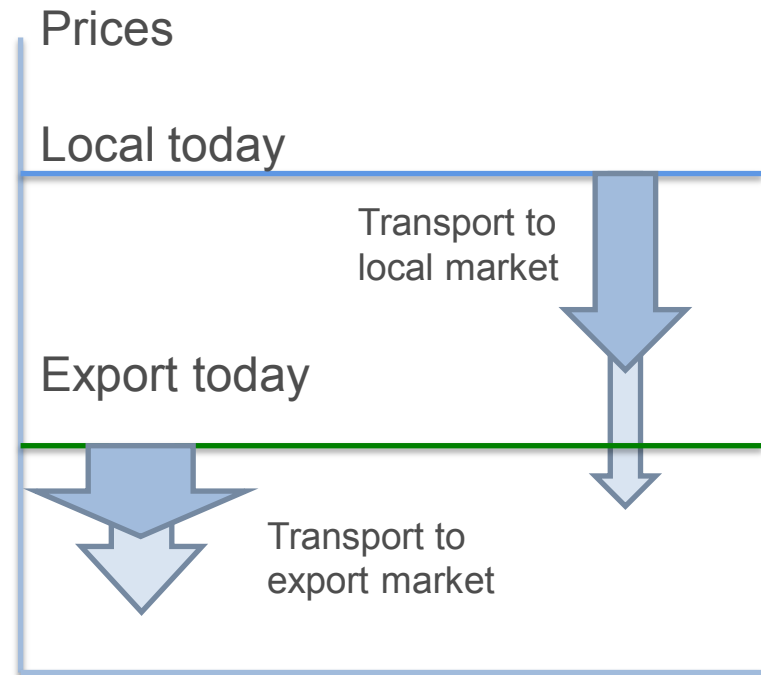


Illustration: Sund Energy

How and where will Arctic gas be sold in the future?

Illustrative sketch: Varying markets to maximise annual netback
Could give different load factors during the year

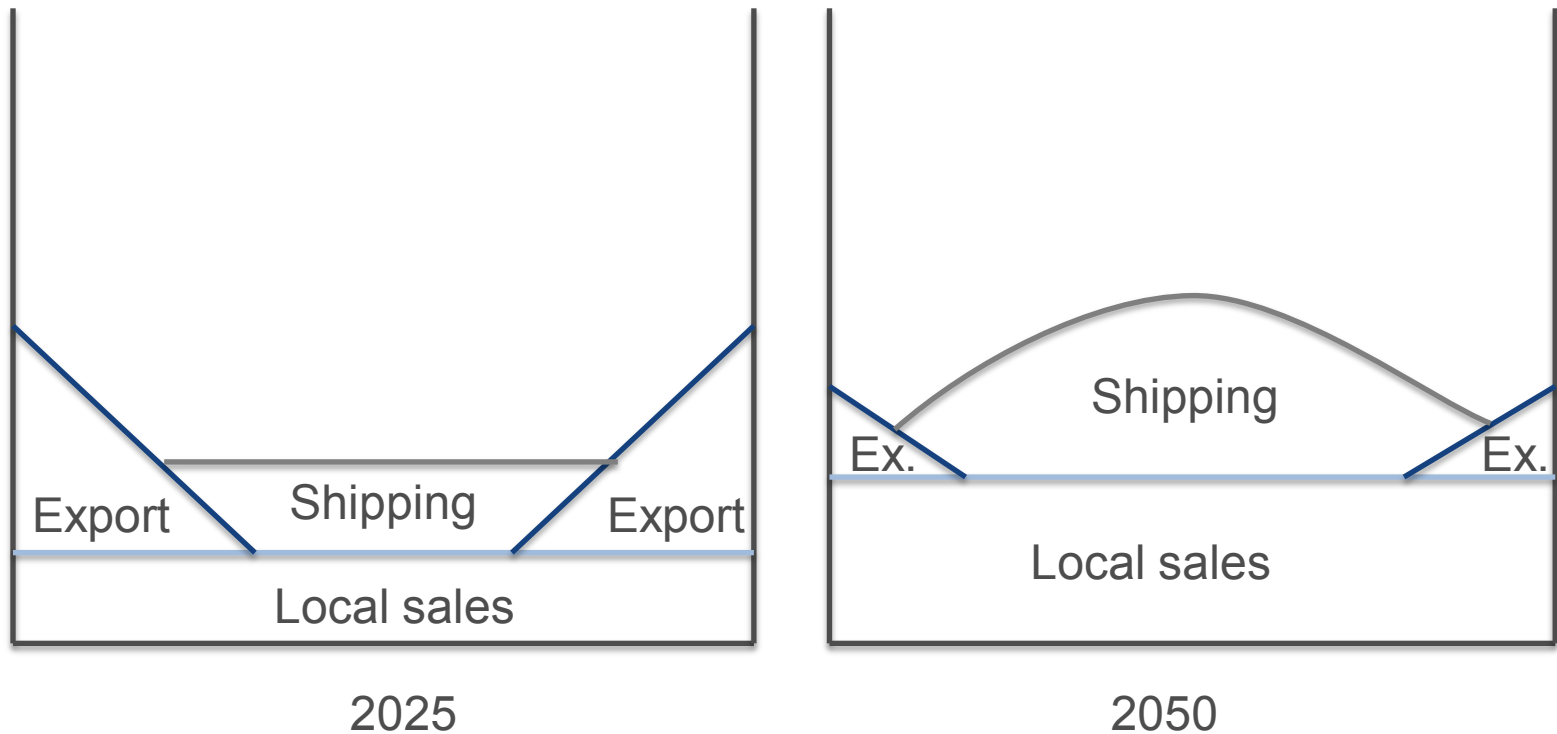


Illustration: Sund Energy

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The arctic opens new opportunities for infrastructure

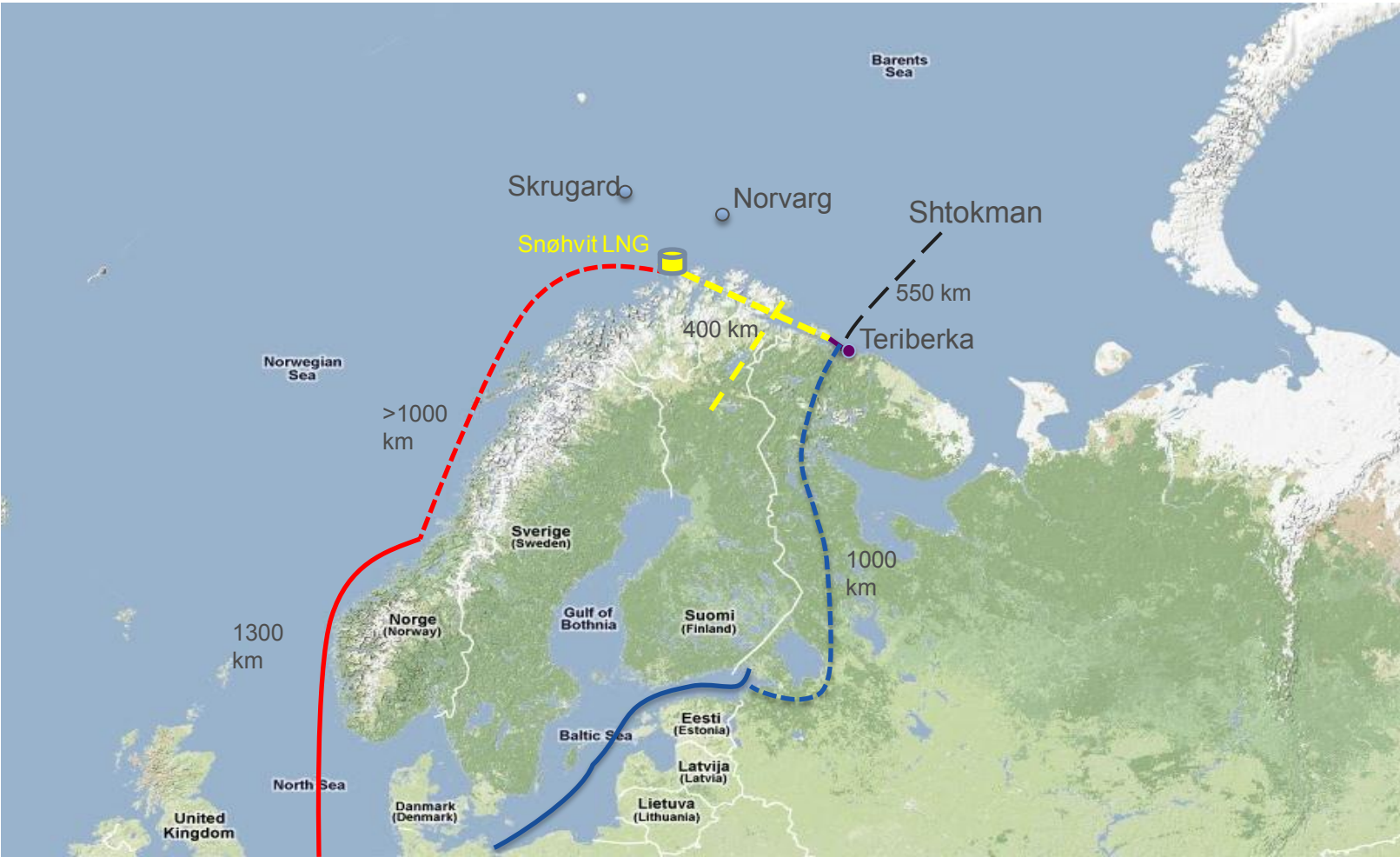


Illustration: Sund Energy



Some simple rankings – top down for Norway/Russia

What is the best pipeline option to Europe?

- Existing, then new with market, then large offshore without market
- Marginal costs fall with volume – lower unit costs and lower risk
- Distance matters, too, and options from each

What is the best LNG option from the North?

- Existing site, then new with good location (optionality), then “redundant”

Where could the best local sales be?

- Existing market, attractive prices, later new markets with high payability

Ranking of pipelines?

1. Shtokman
(even better with more volume)
2. Yamal?
3. Offshore Norway

Ranking of LNG?

1. Snøhvit
(even better with more volume)
2. Yamal
3. Shtokman

Some benefits of a more versatile, joint solution

Timing:

- More oil and gas earlier
- Easier to make decisions on fields and infrastructure on both sides

Cost efficiency:

- Lower costs for both sides with a joint pipeline and joint LNG
- Would make arctic gas from the region more competitive

Local supply:

- Easier to offer energy locally for growing demand in power, minerals, shipping and more in Russia, Finland, Sweden, Norway – for profit!
- Easier to choose between export markets – by pipe or LNG

How to make robust solutions under uncertainty?

Producers: Having more than one choice often helps

- Alternative infrastructure, alternative markets, different prices
- Easier to develop fields for producers with more than one option
- This may also include option to produce less “flat”

Infrastructure: Stepwise, or low capex vs opex is easier

- Large economies of scale, but risky to build too large
- Booking of capacity can secure investments

Market: Capacity easier (and cheaper) to book than the gas itself

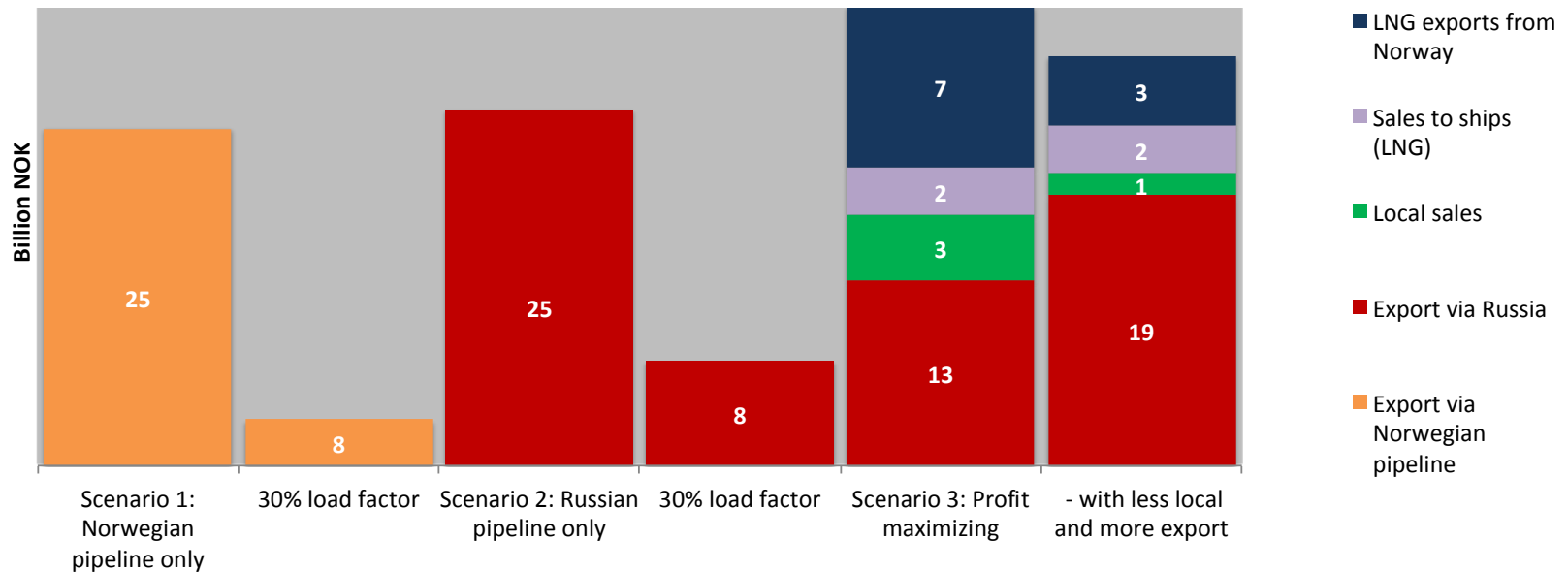
- Ensures more options/competition, securing supplies + lower price
- Could be valuable even if gas never flows in that capacity!

Further illustration: Possible cash flow at plateau

Three scenarios: Cash flow could be higher in combined solution

Especially if planned base load is not possible

Example of 25 bcm/yr netback to Snøwhit area



We are happy to discuss further!

Selected recent work by Sund Energy that may be of interest

- Scenarios for European gas 2020 – prices and flows
- Gas for transportation (road + sea) + biogas

Currently working on related issues

- Gas to industry in Norway – prices and terms
- CCS in a commercial setting

We offer strategic and commercial advice + partner selection

- Producers, TSOs, traders, large buyers, governments
- Gas, electricity, environment and more

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