



LNG global economic trends

MarTech LNG value chain development seminars

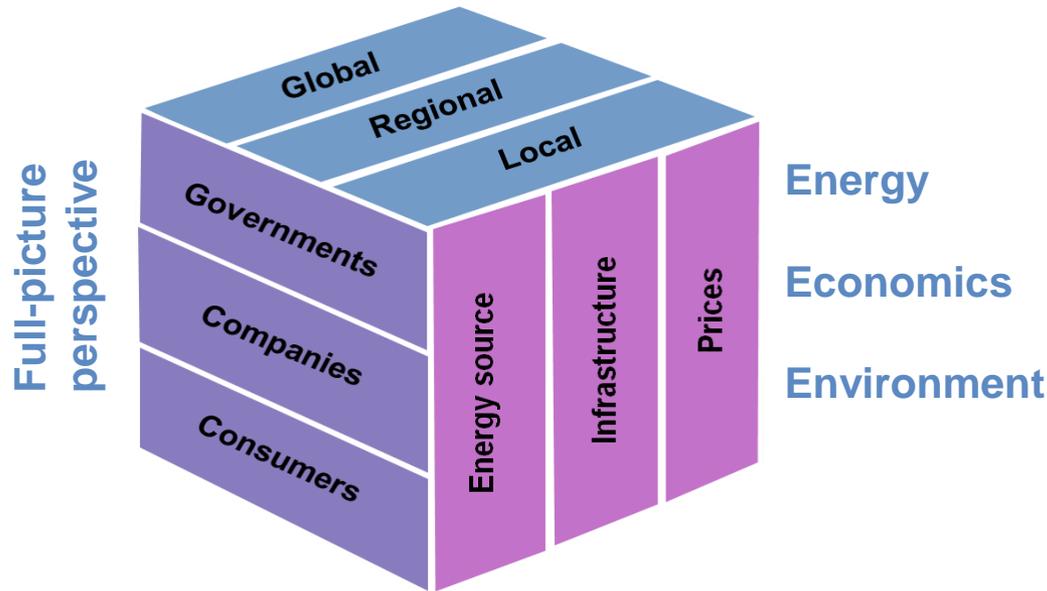
Klaipeda

9 December 2014

Alan Whitefield

www.sundenergy.com

Sund Energy helps navigate into the energy future...



Learning between countries, industries, energies, technologies and more...

In the LNG area, clients include:

- Sellers
- Buyers
- Investors
- Logistics

Typical assistance:

- Strategy and business model
- Market analysis
- LNG contract negotiations
- Partner search
- ...and more

...by understanding the full picture of stakeholders

LNG is 50 years old this year

Since 1964, gas has been liquefied and transported around the world

- Markets have grown and how we produce and consume energy has changed
- The US LNG industry has been turned on its head!

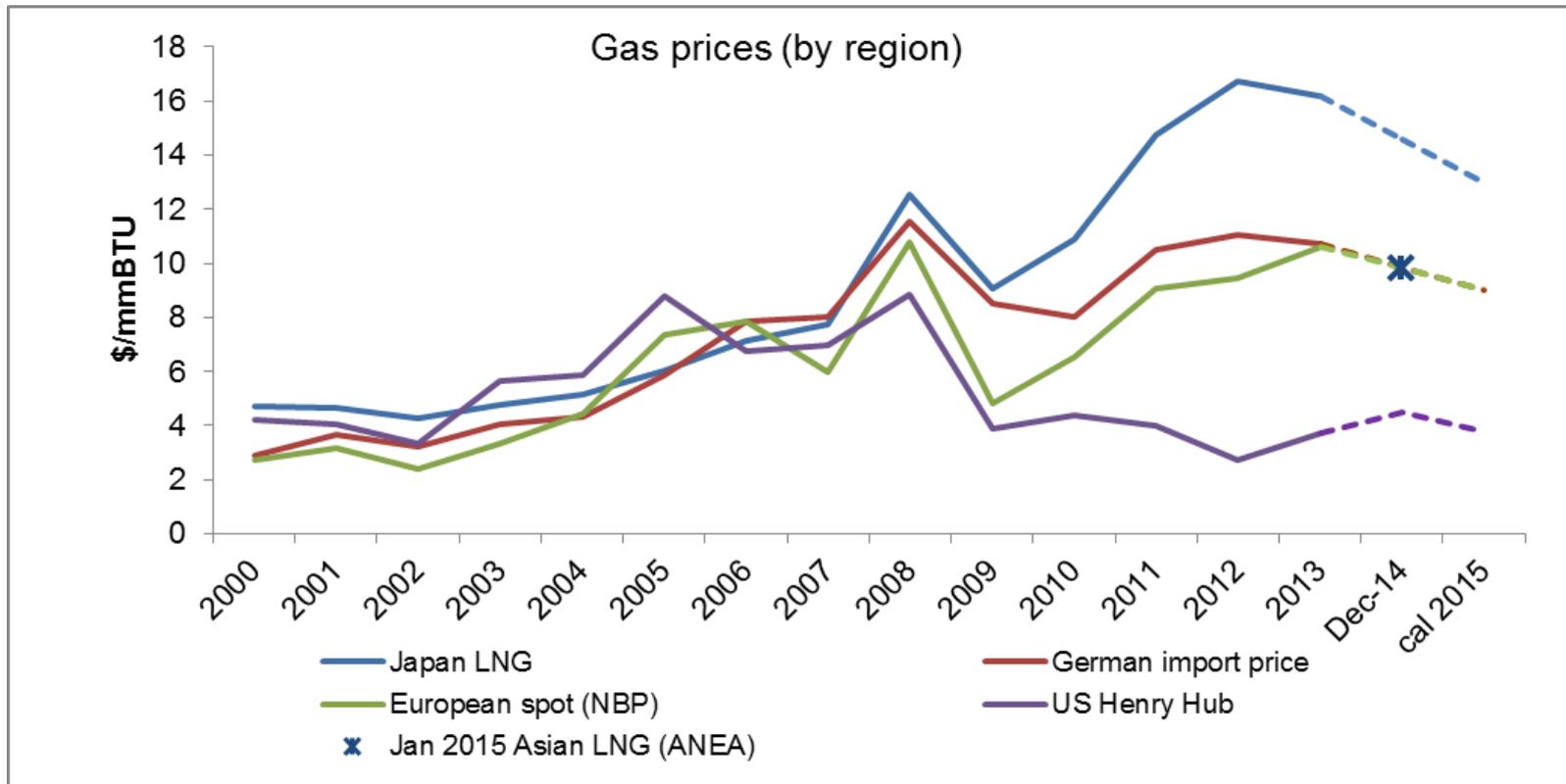


The official ceremony for the delivery of the first commercial cargo of LNG, by Methane Princess, was held at Canvey Island on 12 October 1964

Global LNG prices have had a turbulent decade

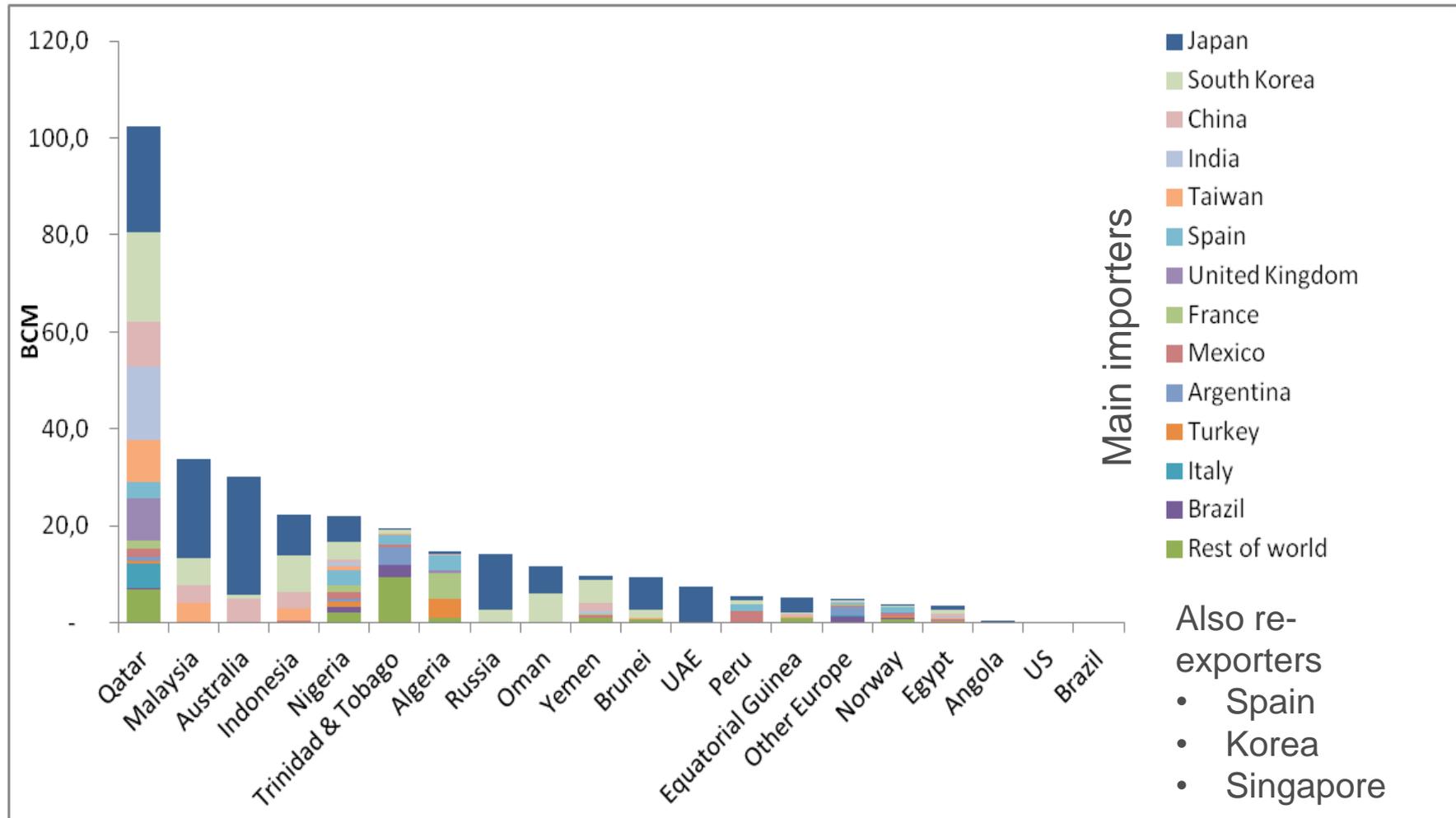
Since 2010, prices have been on the increase (until recently...)

- Fukushima and high oil prices kept Japanese LNG demand and price high
- US shale gas and recession in Europe kept LNG demand low



Source: Sund Energy with data from BP Statistical Review; ICAP

To 2013, more sellers, more buyers – same demand



Source: Sund Energy with data from BP Statistical Review, 2014

So what is happening now....?

2014 has been a remarkable year for LNG pricing, and energy on the whole

- Oil down a lot, -38% since last December
 - But most of the fall has happened in the past three months
- Gas prices have followed, more in the UK than elsewhere
 - Falling demand from power generation, on cheaper alternatives; mild weather
- But LNG prices have fallen faster and further
- LNG demand has been weak
 - Fairly neutral weather in general for the northern hemisphere
 - Also Latin American demand low compared with previous years
- LNG supply has stepped up a great deal this year:
 - Australasia putting pressure on Middle East as chief LNG producing area
- **What next for LNG fundamentals?**

Gas and LNG prices, today compared to this time last year

Prices \$/ MMBtu	LNG swaps price		US gas hub price		EU gas hub price		UK gas hub price	
	JKM Month	JKM Year	HH Month	HH Year	TTF Month	TTF Year	NBP Month	NBP Year
Last year	19.00	16.00	4.25	4.10	10.77	10.26	11.78	10.98
This year	9.30	10.50	3.80	3.60	8.76	8.52	9.10	8.74
Change	-51%	-34%	-11%	-12%	-19%	-17%	-23%	-20%

Sources: Tullet Prebon; Marex Spectron; ICIS, EIA

LNG supply will increase further

More planned capacity than expected demand for LNG

- New projects will compete for demand (Australia, US, Canada, East Africa)
- Price only differentiator?

Some decisions based on history

- Experience with high margins

Long lead times and strong minds

- Little interest in weak signals

Meanwhile demand stagnates

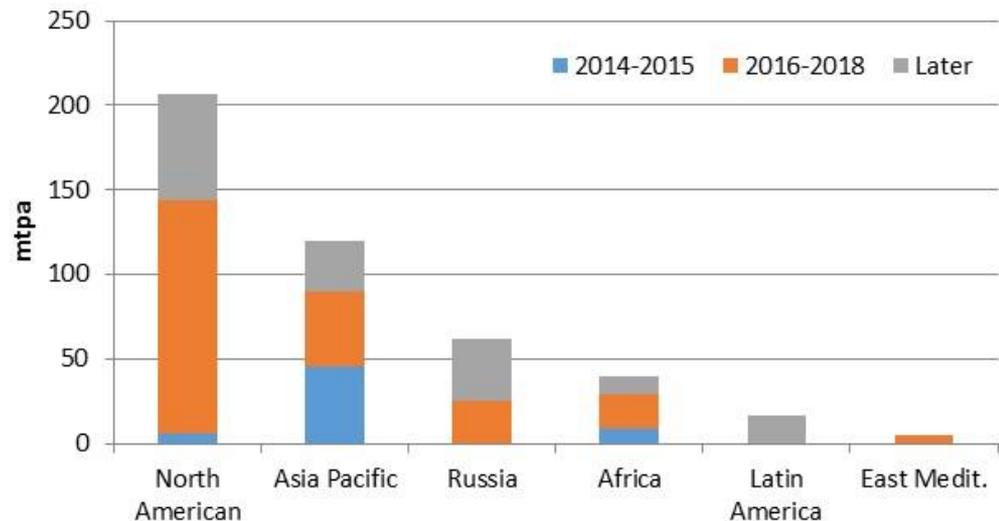
- Recession, climate, price

“But my project is better!”

- Perhaps...
- Price still matters most, not cost

Much new liquefaction capacity expected

Current liquefaction capacity at around 300 mtpa



Source: Sund Energy and Interfax

Current LNG supply will continue to flow

Qatar will continue to play an important role, despite losing market share

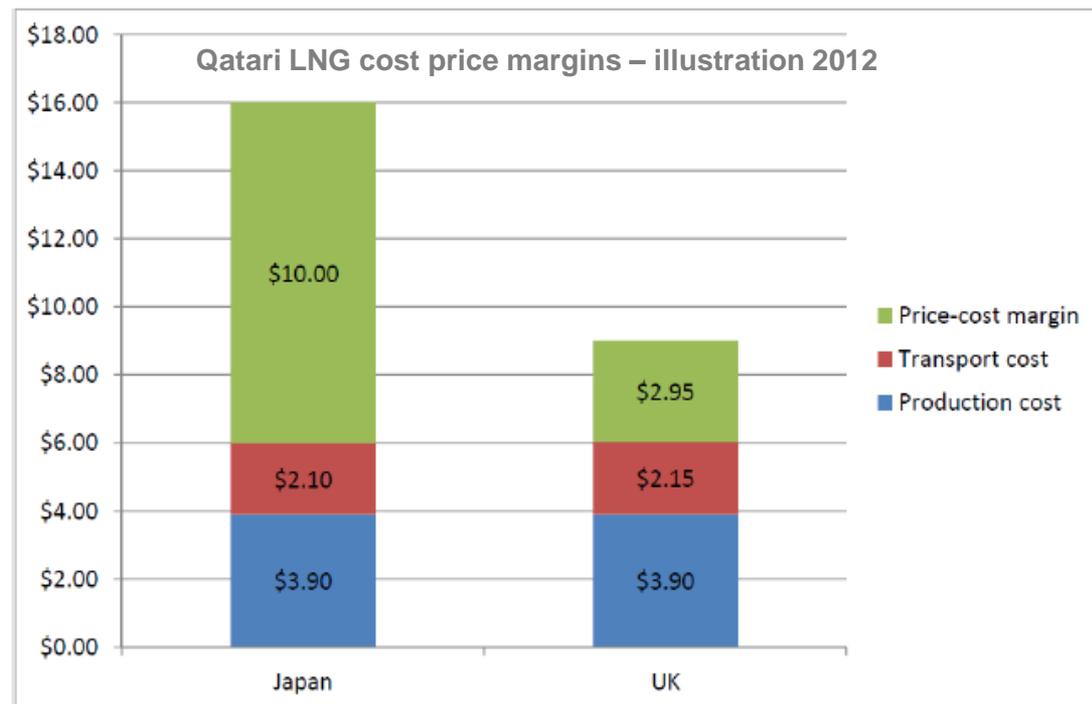
- Less LNG to Asia, more to Europe
- Optimising flows, with more uncommitted LNG arriving in new markets

Cost price margins for Qatari exports are still high to UK

- Price convergence between Asia and UK
- Overall revenues may be lower, but Qatar can still sell in volume

Contractual terms will change

- Destination clauses may be removed
- Potential for more hub-pricing in contracts



Price convergence in gas markets is happening



Global LNG demand uncertain

Pricing dynamic for generation in Europe changing

- Coal now not quite as cheap as before
- Carbon taxes in the UK are slowly squeezing coal out
- Renewables and new Capacity mechanisms in UK and potentially Germany
 - Gas fired generation the ideal back-up fuel for renewables

LNG provides security of supply in the event of more Russian threats

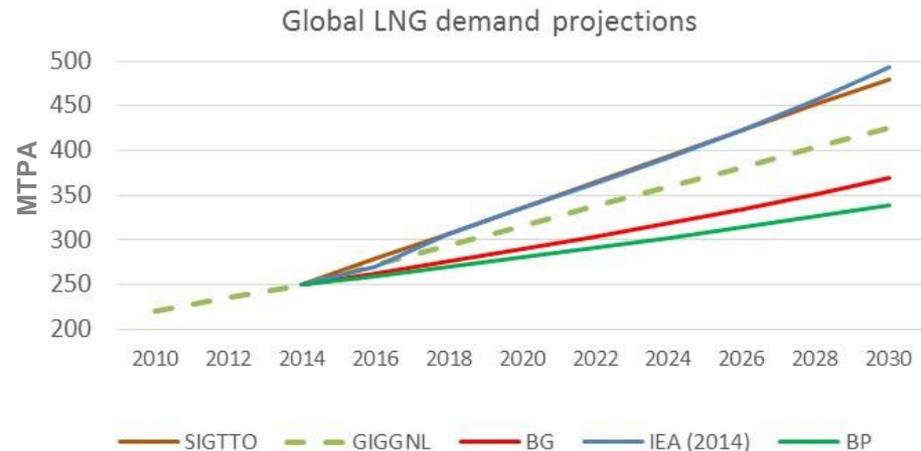
- Certainly effective in Lithuania!

Chinese demand projections lower

- Weaker growth for demand
 - State f'casts adjusted down 15%
- Pipelines from Russia, new deals

But new demand could come...

- Weaker oil and LNG prices will drive demand
- LNG for marine transport
 - MARPOL restrictions arrive in a few weeks
 - Much depends on relative pricing to MGO
- LNG for road transport - Several benefits over diesel



Source: GIIGNL; SIGTTO; BG; IEA; BP

Global LNG demand from small scale will grow

Small scale LNG volumes are growing

- China, US and Europe lead the way with marine and road transport uses for LNG
- LNG powered locomotives in development
- Small scale generation also growing with new markets for power spreading globally

LNG as a marine fuel

- Over 50 vessels in operation, 60 on order
- Forecasts 1500 - 2000 LNG powered ships 2020
- 10% of global bunker demand could convert
 - Potentially 20 mtpa of additional LNG demand by 2020, 40 mtpa by 2030

LNG as road fuel

- Mostly HDVs and municipal vehicles, up to 1000 in Europe already
- Demand in Europe could be 4 – 12 mtpa by 2020

Pricing of retail LNG crucial to rate of growth

- Prices have been high
- Now more competition and lower underlying prices



Brunsbüttel truck-to-ship refuelling

Price, as always, is a key driver of demand

Our new 'low' price environment changes decision making

- Oil indexed LNG contracts to Asia and Europe will fall
 - There is a time lag, so lowest prices may not be seen until next summer
 - Last year, contracts were around \$15, next year could be below \$10 / MMBtu
- Oil indexed gas contracts are affecting gas usage in Europe
 - Gas now more competitive for power generation
 - Could stimulate demand, although unlikely to return to pre-2008 levels

But what will a low oil price environment do for LNG supply

- Oil indexed LNG contract renegotiations in Asia before 2020
- Henry Hub priced contracts less competitive
 - US projects have lost some of their edge
- European hub priced LNG contracts
 - Price convergence
- Investment in brownfield sites in Australia?
- Canadian LNG projects sustainable?
- How many LNG projects, beyond FID, will actually happen?



From sellers' to buyers' market – then what?

LNG a last resort for producers, and “luxury” for buyers

- LNG plant were seen as very expensive, and there was a “queue” of projects (stranded gas to stranded markets – few skilled builders)
 - LNG was seen as difficult, dangerous and “luxurious”, only for the few

Traditional shortage helped sellers in pricing high

- Long term contracts, premium prices, especially to Japan
 - Limit to how much each project could sell to Asia (not large enough)
- Diverse supply portfolio (and growing own ownership)
 - Security of supply and consensus on pricing (among sellers)

Overflow of new supply options has changed the tone somewhat

- Why should we pay more than others?
 - Why should we pay more for projects that are overrun?
- Learning from new offers in negotiations with others
 - More comfortable with hub prices in other markets now
- Selling to optimise own portfolios – mainly Europe, but also Asia

LNG pricing in contracts is at a crossroads

US pricing is not as attractive as a year ago

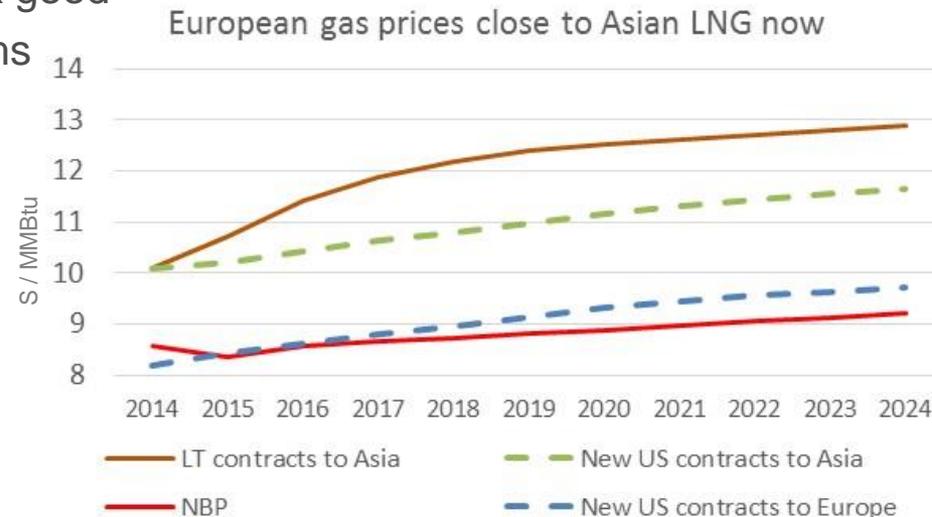
- Oil indexed LNG contracts now look good
- Henry Hub discount is less, but terms of contract are better for buyers
 - More flexibility and optionality

Is this a temporary phenomenon?

- Some buyers will still want SoS
 - Security of supply is a driver
- Many will feel comfortable with oil
 - Oil seen as easily hedgeable
- However, optionality and flexibility is valuable to many now
 - The market is becoming more sophisticated

How will this affect LNG and gas prices in Europe

- The trend has been moving away from oil-indexation to gas-indexation
- This could slow down as oil-indexed prices are more attractive now



Source: CME; Marex Spectron; Sund Energy

Other trends come with market maturity

Trading

- Spot trading growing from 19% in 2010 to 27% last year. 35% this year?
- Restricted Third Party Access in places like Japan is coming to an end
- More players involved on the buy and sell side
- Singapore making moves to be the Asian LNG hub

Hedging

- Traditionally, buyers could choose to hedge their price exposure with oil futures
- Now, JKM swaps or other derivatives make hedging easier
- JOE in Japan is a step forward, but not too successful.... yet
- Hedging of US sourced LNG very easy

Vessels

- 400 now, 140 on order.... could be 600 by 2020
- More than 10 FSRUs
- What will the effect on charter rates and utilisation?
 - Already prices have more than halved in a short time

So to conclude, we can embrace this uncertainty!

Uncertainty in markets could well be LNG's best friend

- Easier to have LNG as option for security of supply than another pipe

Fukushima example of value of LNG – but temporary

- Some flexibility offered not only by producers but also from buyers
 - Get used to meeting your customers as competitors

Be the risk management friend of the markets...

- Option to take LNG at peak or disruptions

...but beware it needs own risk management to change!

- Volatility and uncertainty could make you kick yourself in future
 - weaning players off the 20 yr contracts – both buyers and sellers
- Find a way to live more like oil – flexible and dynamic

Remember – cheap LNG to the world is a net good ;-)

- Environment, competition, security of supply
 - But new tricks of the trade needed to make the margins dreamed of
- Be agile, commercial and disciplined!

We are happy to discuss further!

We offer strategic and commercial advice + partner selection

- Small and large buyers, governments, TSOs, producers
- Gas, electricity, environment and more

Selected recent work

- Sourcing strategy and gas contract (re)negotiations in Nordics/ Baltics
- Small-scale LNG value chain and market potential analysis
- Gas price scenarios for 2020

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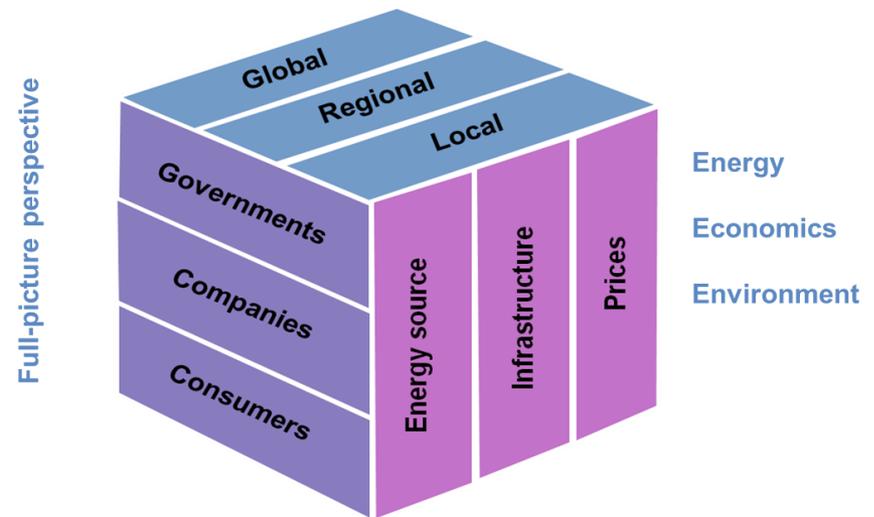
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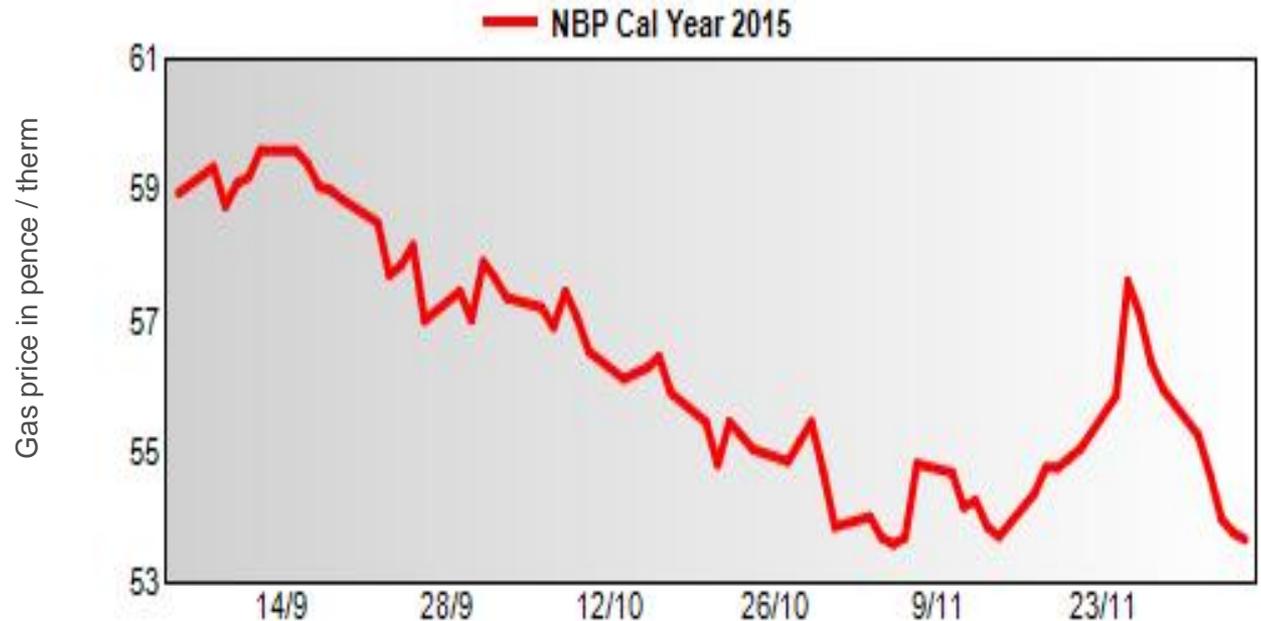
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NBP price

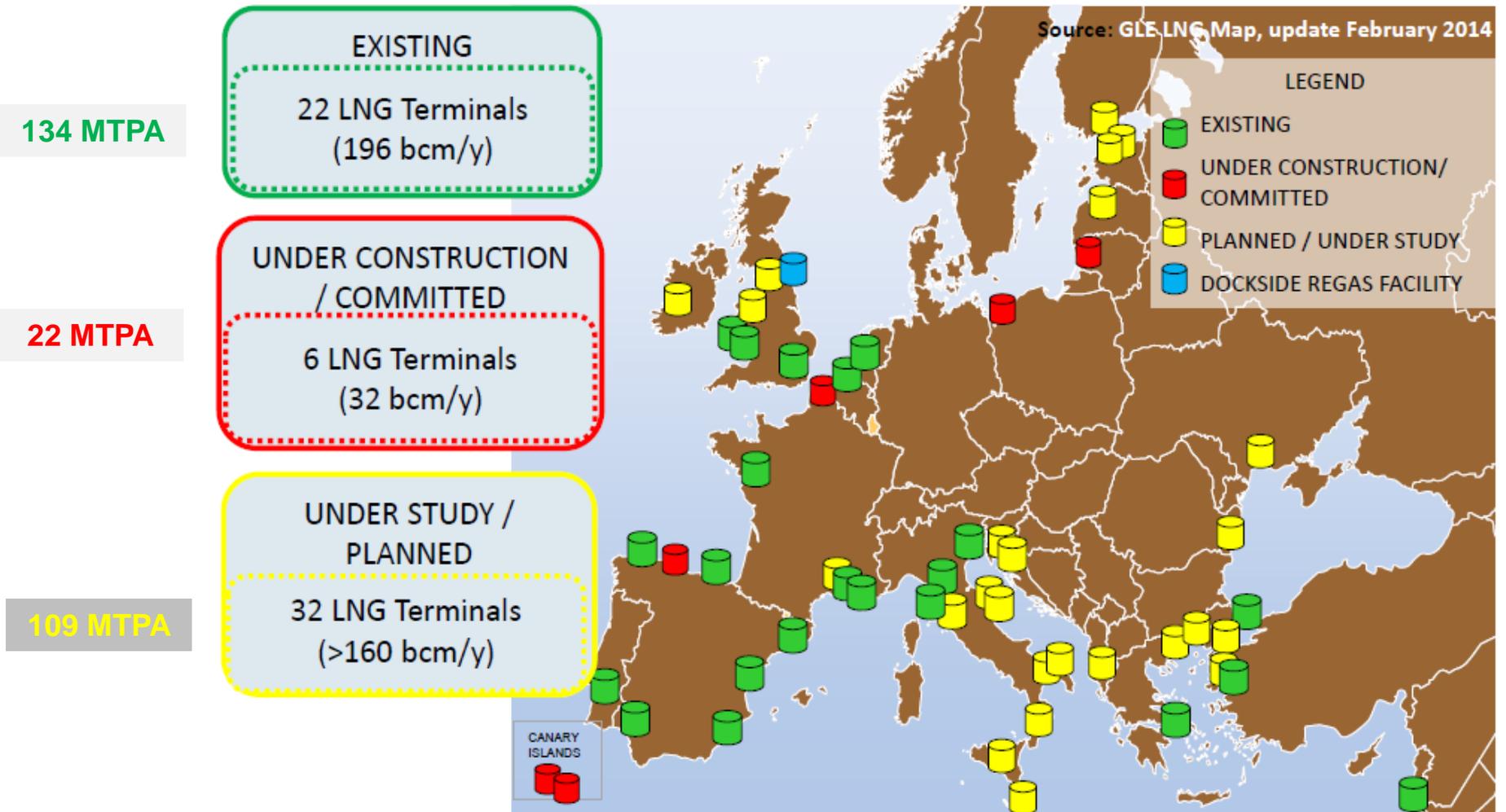
European hub prices weaker, partly on LNG imports

- Hub gas in Europe have seen 12 months of falling prices
- End November, prices turned a corner again and rebounded, but now LNG imports (and mild weather) will lead to lower prices through the winter
- Without a very cold Q1, or significant geo-political events in Europe, we could see hub prices below **40 pence / therm** this winter (< \$7 / MMBtu)



Source: Marex Spectron

LNG import capacity – much spare, but still growing



What is best, then? Exposure and risk management

If you want the same costs as others – oil link could be best

- Most ship owners stick with oil products (MGO)
- Having LNG linked to MGO prices feels safe
 - Especially if you expect a long term shortage of gas

If you believe oil prices will go up and gas is plentiful

- Significant cost reductions possible in choosing gas linked price
 - Hub + cost could well be the lowest price in the future

Uncertainties on both sides

- Different tools available for hedging – both oil and gas
- Some also choose dual fuel, as a natural hedge
- Important to work on contracts to suit preferences
 - Term, pricing, delivery terms and more
- Both absolute cost level and relative prices important to consider

Prices will change as the supply chain changes

Small scale, almost as trendy as shale gas!

- They are also helping each other at many levels
 - Sustained discount to oil grows market – the larger the margin, the quicker the growth
- New areas of use develop
- Volume estimates vary for bunkers in Europe (in line with global LNG volume uncertainty)
 - 2015 in the range 0.1 to 0.3 mtpa
 - 2020 in the range 2.0 to 4.0 mtpa
 - 2030 in the range 5.0 to 10.00 mtpa

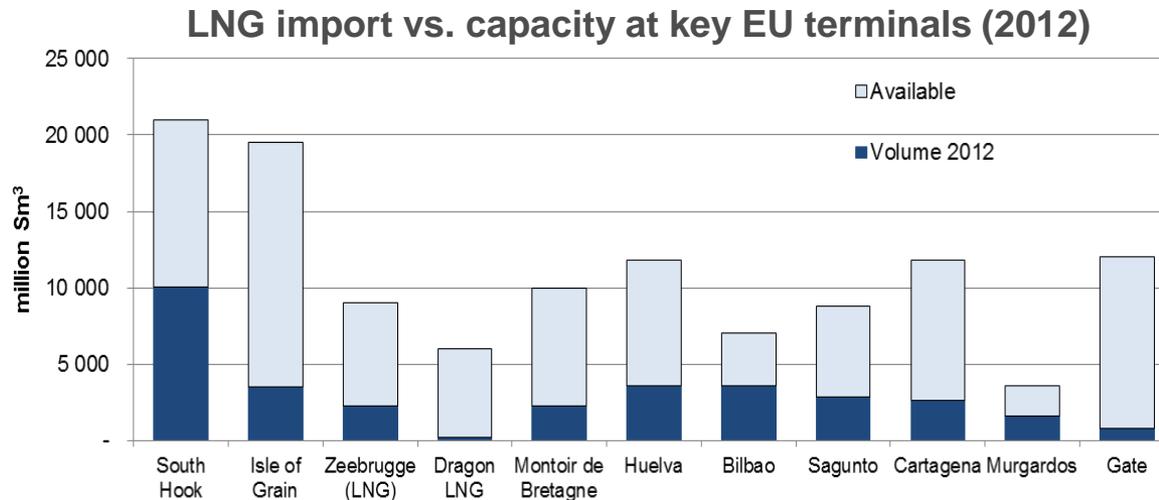
Conventional technology adapted to smaller solutions

- Better solutions for remote production, making more gas available
 - Breaking some old rules about what can be economic gas
- New entrants will provide better solutions and more use
- With more competition, value chain prices will be lower
 - More similar retail and wholesale prices

So much has happened in the last year!

- What will the market look like in 20 years?

There is much spare capacity in Europe's terminals...



Possible future hubs

Data: IEA, GLE LNG, 2013

...and increasingly many ports with available bunkering infrastructure

Current

Stockholm
Rotterdam
Kollsnes (CCB)
Halhjem
Florø

Future (some examples)

Risavika	Hamburg	Bodø	Pori	Rostock
Lysekil	Antwerp	Mongstad	Sillamae	Helsingborg
Turku	Zeebrugge	Øra	Paldiski	Copenhagen
Porvoo	Ghent	Helsinki	Riga	Aberdeen
Tallinn	Aarhus	Hirtshals	Swinoujscie	Dunkerque
Klaipeda	Gøteborg	Brunsbüttel	Lubeck	

New LNG pricing environment – large scale LNG

US is a game changer, no doubt

- Certain projects WILL be online 2016/17 (Sabine Pass and later Cameron)
- The number of likely projects for 2020 is increasing
 - Approvals easier to achieve now – US government changing stance
- Many more *possible* projects for 2025, but many observers are sceptical

Volume from North America

- Sabine Pass 8 mtpa in 2016, 16 mtpa by 2018, possibly 24 mtpa by 2020
- Who will have that early volume? BG then Korea, India, Japan...
- But where will it be sold: much in Europe...?
- *Interesting points and current..... A ramp up in LNG trading in Atlantic basin now looks certain, with NW Europe as the 'sink' for surplus volume*

Volume from elsewhere

- New supply from Australian and Papua New Guinea supply may be oil linked
- This should free up even more Henry Hub priced supply to come to Europe... provided there is trading and efficient optimisation

New LNG pricing environment

Henry Hub priced LNG

- Cheniere have sold floating price LNG supply contracts at Sabine Pass
- 115% of Henry Hub monthly price PLUS \$2.25 to \$3.00 = e.g. \$7.00 / MMBtu
- Plus shipping to Europe at around \$1.25 currently = e.g. \$8.25 / MMBtu
 - But this is only the price delivered to a European LNG terminal, conventional size
- Forward curve projections 2017 – Europe delivered price \$8.50 to \$9.50
- By 2025, forecasts have the LNG price in the range \$7 to \$10 in Europe
- *To translate the delivered LNG price in Europe into a price available at an LNG bunkering facility is not clear nor simple to forecast...*

Volume

- Volume too is uncertain
- How much will go to Japan, Korea, China, India?
- What spare will be there for the small-scale market?
- Where will it be sold, facilities in Gate, Zeebrugge, Spain?

Impact of more LNG to the market – more like oil!

Commoditising – all gas is gas – nationality less important

Equalising prices – spare LNG can go anywhere

- Low cost transport cost versus arbitrage opportunities
- More than 30% of deliveries now NOT on LTCs

Cheaper security of supply

- Easier to build regas terminals (or hire FSRU) for backup than rely on new pipelines – optionality

Established truths die – several!

- “Everyone gets rich in Japan”/“US wants all the LNG we can make”
- Value of optionality in uncertain times – infrastructure and sales

All fearless developers forget to look around – oversupply

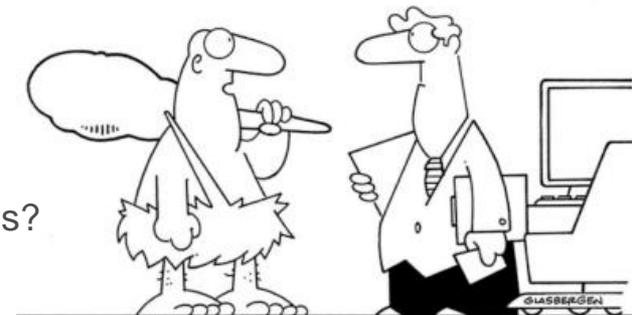
- When will they ever learn?

What next?

- Merit order elasticity?
 - Delay projects, optimise flows, turn off completely?
- OR find new demand, risk management or business models?
 - Some new uses of gas, when LNG is available: transportation

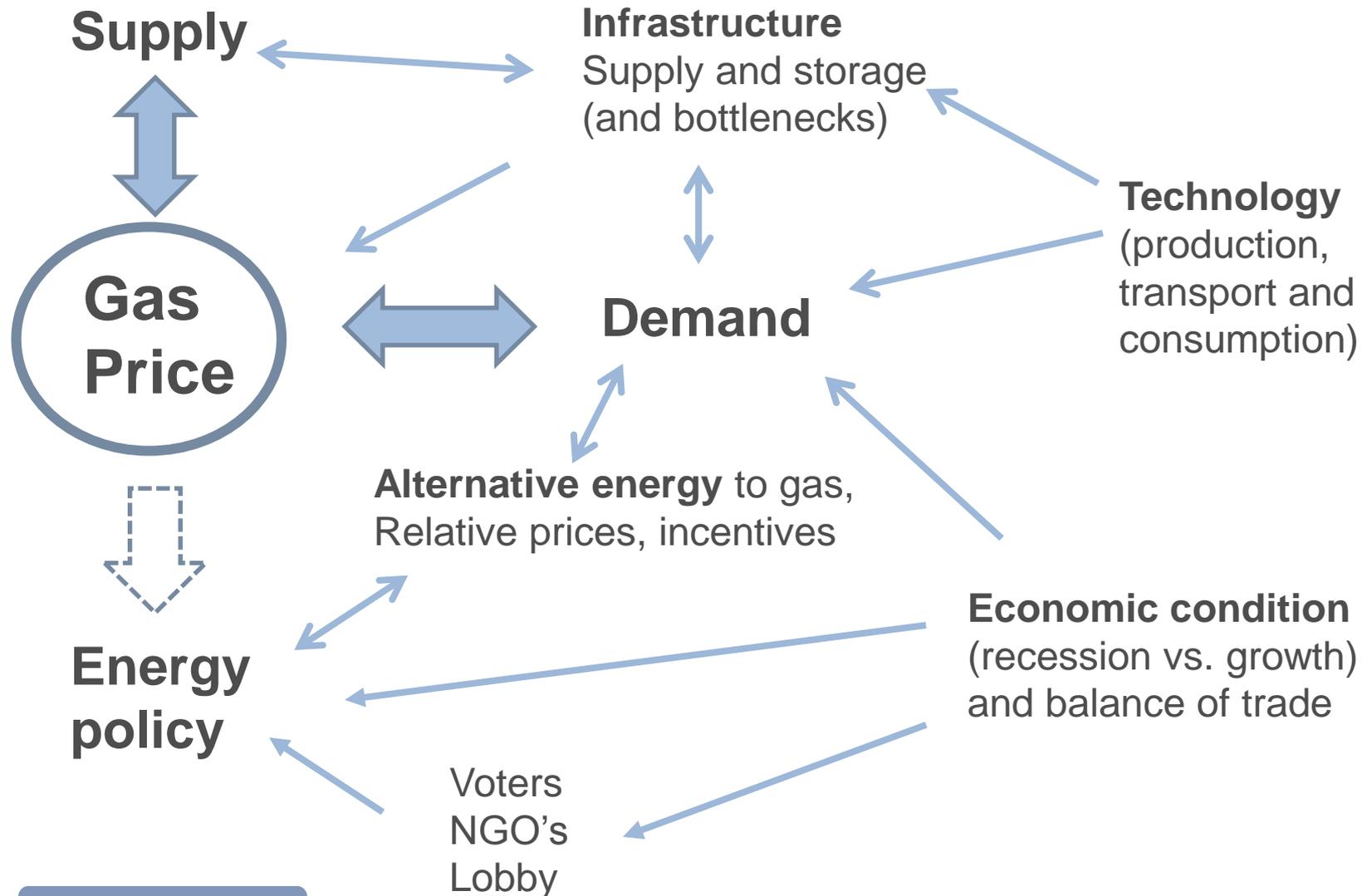


Lithuanian FSRU



“My financial strategy? Hope for the best, but plan for the worst.”

The picture is complex, and drivers change over time



Asian optimism has moved from Japan to China

Large and growing economy – already importing LNG

- Experts were encouraging more capacity for the market even last year

Now, forecasts seem a bit more sobering

- UBS China reduced forecast gas demand by 14%
 - Now 285 mtpa for 2020
- PetroChina 238 mtpa in 2020

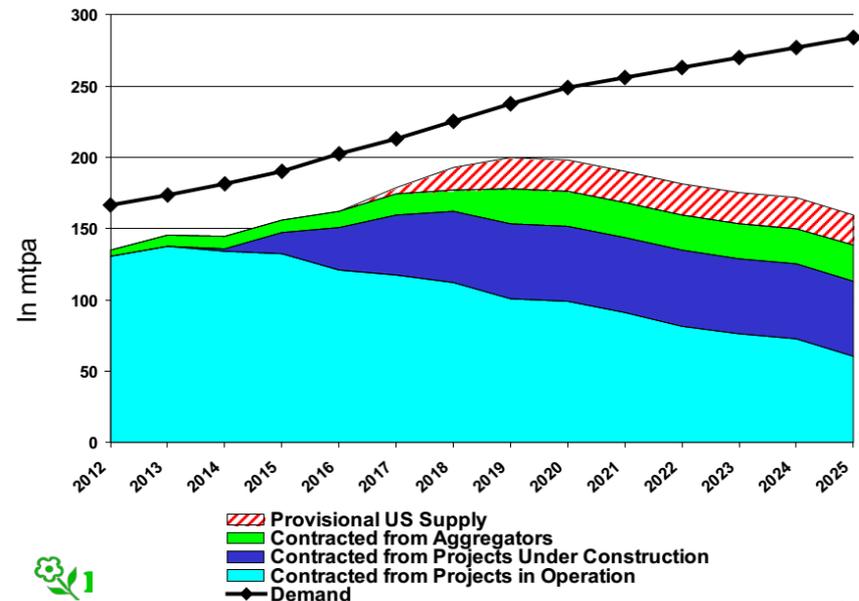
Other factors

- Pipeline imports
- Domestic production
- Renewables

Demand is more difficult to forecast than liquefaction!

Asian demand forecast presented in 2013 at Flame

**Asia LNG Demand and Contracted Supply
2012 to 2025**



In this age of uncertainty, investment decisions change

This could be an advantage for LNG – much more flexible!

- Assets that could be used for several markets – better than pipelines
 - Even added value of floating – FLNG and FSRU
- Easier to reach smaller markets – by smaller ships and even trucks
 - Where there would never be pipelines
- Able to meet unexpected peak demand or serve as backup

Investing in pipelines much more difficult with uncertain demand

- Pipelines have always been the first choice of developers
 - Large economies of scale – easy with steady growth
- Lower demand brings risk of stranded assets – more so with pipelines
 - This risk is not acceptable to long term infrastructure investors
- So, LNG appears more attractive, for mobility and flexibility
 - But this requires different risk management and business model
 - The old “pipes on ships”/long term contracts not flexible enough

Time to look at market payability, not only cost?

«We do business as we always have»

- Traditional approach is easier:
 - Sell to large importer, for sale to grid, industry and power sector

High value segment has been growing lately

- Using LNG to replace oil – new market and better alternative prices

«We don't have time to deal with little things»

- Volume still better than value?
- Prices in Japan have fallen from the perceived guarantee of \$18
 - More realistic price for new deliveries \$10-12
- Meanwhile, LNG competing with oil to end users double that
 - Some already capturing this segment

China deliberately keeping oil demand down

- Gas and other fuels preferred for growth, to reduce pressure on oil price

This strategy seems to be working (with US/Can production)

- Last week's oil price fall wake-up call for many – signs in LNG, too!

New LNG pricing environment – how to max netback...

The Qataris started selling LNG at market prices to UK

- “Gas is gas” – sold at market prices, not cost plus – more could come

The US has introduced cost plus gas: Henry Hub + costs

- Cheniere went public with their pricing formula early from Sabine Pass:
 - 115% of Henry Hub monthly price PLUS \$2.25 to \$3.00 = e.g. \$7.00 / MMBtu ex terminal
 - Plus shipping to Europe at around \$1.25 currently = e.g. \$8.25 / MMBtu
- Unusually transparent for the gas industry – and tempting for many
 - Some uncertainty to future of “the world’s cheapest traded gas prices”

Japan and other Asian countries used to pay a premium on LNG

- Now inundated by sellers from new projects
 - US, Australia, Canada – Tanzania and Mozambique next?
- More oversupply gives lower prices on new deals
 - Currently lower than LNG to Europe!

Competing with oil is better than with coal – even at \$60 Brent!

...cut costs or simply turn off?

Optimising portfolios (both buyers and sellers) expected

- Not only for price, increasingly set in market
- Also logistics – more swaps, regional trades – again!

Both Canada and US could see different preferences, soon

- West coast mainly for Asia, East coast mainly for Europe?
 - Would make sense, if prices equalise!
- Not one owner, large diversity, even within projects
 - Large companies will optimise own, global portfolios
 - Smaller developers will just want cash, any cash...

Will any LNG projects turn down or off?

- If so, which? What's in it for them?

Much traditional merit order/supply cost thinking when building

- But in reverse: The most expensive chain «should» turn down first
 - Reluctance to change plans - arguing sunk costs and no market power

How long will banks and investors accept this thinking?

New logistical solutions are now considered

Israel could use spare liquefaction capacity in Egypt for export

- Money trumping politics

Oregon wants to import Canadian gas for LNG exports

Trucks can send LNG more than 500 km – and still have a margin

- Norway, Brazil, China and more
 - Especially when competing with oil
- Seen as a cleaner fuel for ships
 - Important to be low-sulphur soon



So, to conclude – consider different, closer markets...

Small scale: We seem to be beyond the worst chicken & egg discussions

- First motivation: Lack of pipelines – this gave small ships and trucks
 - Now economic to transport by truck, in several places more than 500 km!
- Second motivation: LNG as bunker fuel – reduce emissions of SOx and NOx
 - Local ferries, international ferries, merchant ships with base, deep sea ships next?
- Third motivation: LNG can be cheaper than oil over time – globally!
 - Initially only new-builds – conversions next?
 - BUT, what if oil stays low for a sustained period??

Infrastructure is changing, too

- Taking proven technology from larger scale operations to small scale
 - Truck market and blending in biogas new trend in several countries
- From dedicated/ integrated to third party access – port services

Products and contracts

- Long term, binding volume & price → short, more standard, quick negotiations?