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Implications of a global gas market for traditional gas economical paradigms¹

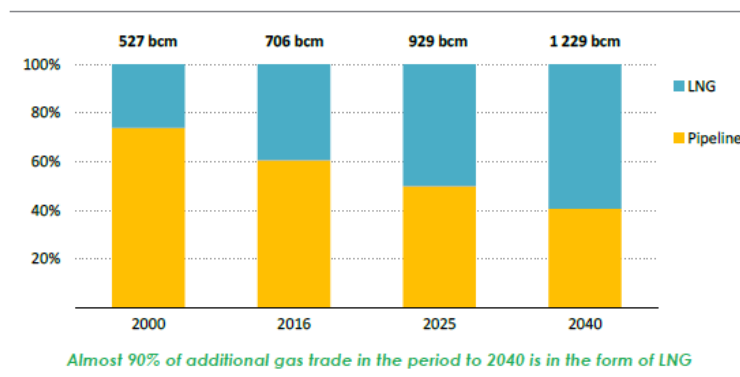
About the Author

Wolfgang has been working in the oil and gas industry for more than 30 years: first with Mobil, then with Duke Energy and thereafter with RWE. He served in different senior management positions across the entire value chain in a variety of countries. After an extended period in the international upstream business he was, i.a., twice responsible for market entry into the liberalizing Dutch retail market. Later, he was engaged in the midstream segment: i.a., he served as RWE's chief negotiator for supplies in Azerbaijan, Iraq and Turkmenistan in conjunction with the Nabucco pipeline project. With Gazprom, he negotiated and litigated about the decoupling of oil and gas pricing. He retired from RWE as CEO of RWE Supply & Trading CZ a.s. in the Czech Republic in March 2016. Wolfgang now runs his own business: 'The Gas Value Chain Company GmbH' (GVC). GVC offers its services as 'commercial operator' (instead of mere consultancy), e.g. in project management and commercial negotiations. Wolfgang also acts as commercial expert in arbitrations and mediations. He strongly supports the product natural gas as an effective means to genuinely battle climate change. His gas advocacy engagement includes the publication of various articles and a multitude of presentations (www.gasvaluechain.com). Wolfgang has been retaining his ties with Brussels-based Eurogas (www.eurogas.org), where he served as board member for 8 years: GVC was the first company to join Eurogas in the new category of 'liaising members'.

Introduction

In its World Energy Outlook (,WEO') 2016 the International Energy Agency (,IEA') spoke for the first time of a *second gas revolution*. The first one is known as the shale gas revolution. The IEA deems the rapid and dynamic development of the global LNG trade nothing less than a second gas revolution. Not only would LNG surpass the share of pipeline gas in global trade shortly, but there was now also a dynamically growing volume of supply with destination flexibility, responding to price signals.

Figure 2.16 > Global gas trade by mode in the New Policies Scenario



Source: IEA WEO 2017

¹ This article, updated and expanded, was initially published in 'Gasmarkt-Telegramm', issue 01/2018: 'Gastkommentar: Implikationen eines globalen Gasmarktes für überkommene gaswirtschaftliche Paradigmen' (www.gvs-erdgas.de)

In its first 'Global Gas Security Review', which the IEA published in 2016 almost simultaneously with the WEO 2016, it stated already in its preface: „As the role of gas ... evolves, a narrow approach to gas security ... in an individual region is no longer appropriate“.

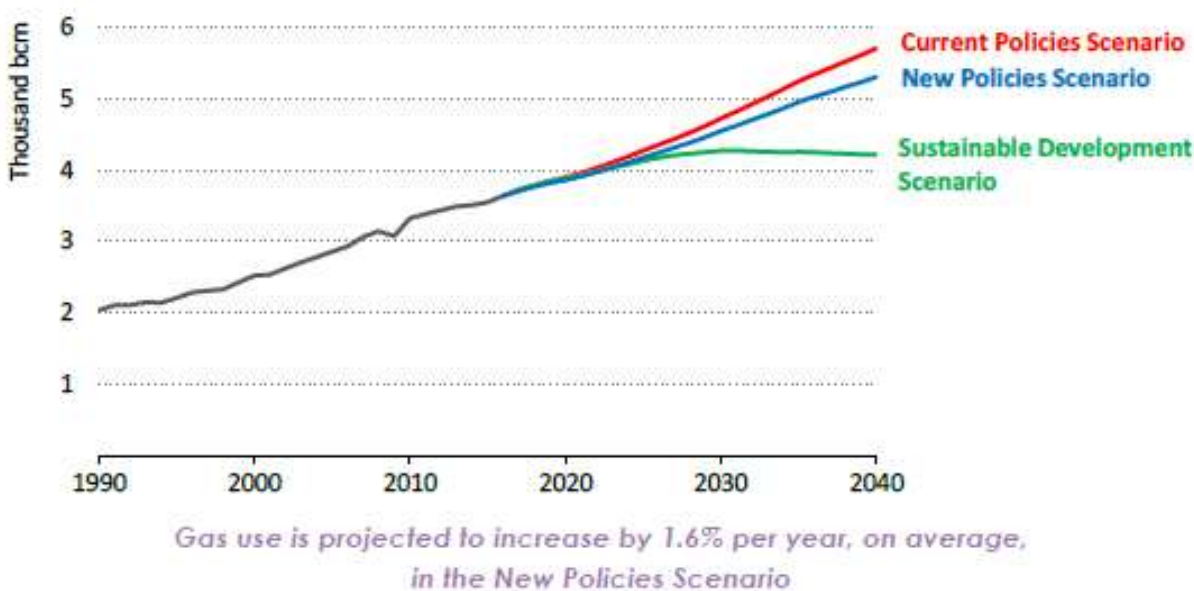
This article aims, based on these developments and insights, to critically discuss and question some of the actual geopolitical and regulatory debates.

Rapid further development of the global gas market and rising demand

In its WEO 2017 the IEA reassesses its findings from a year ago and analyzes the development over the past year and the projected development towards 2040.

The IEA projects for natural gas as the only fossil fuel a respectable growth from currently ~3,600 bcm/a towards over 5,300 bcm/a in 2040 in its 'base case', the 'New Policies Scenario'. Even in the so-called 'Sustainable Development Scenario', which models regulations such that the Paris climate targets could be achieved, demand for natural gas rises to over 4,000 bcm/a.

Figure 8.2 ▷ World natural gas demand by scenario

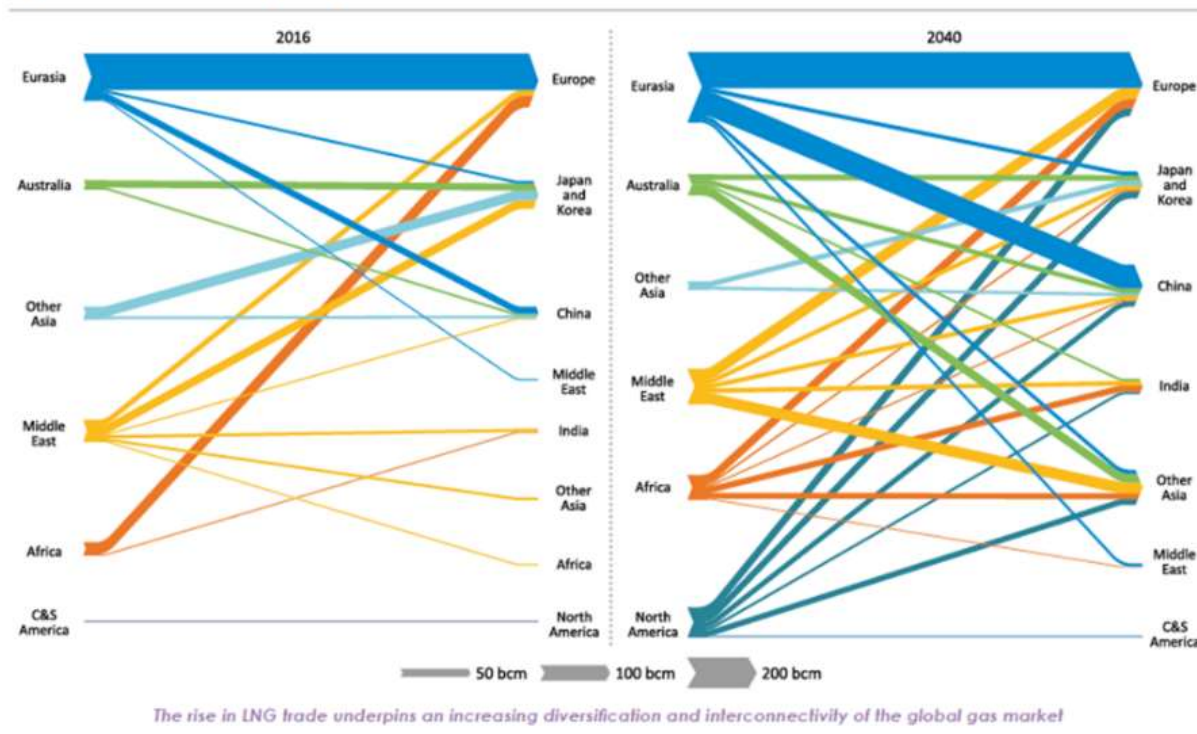


Note: bcm = billion cubic metres.

Source: IEA WEO 2017

The observed and projected rapid further development of a global gas market through the dynamically growing LNG trade causes an exponential expansion of diversification and interdependencies. This is impressively demonstrated on the below IEA global trade chart, completely redone vs. previous years' issues.

Figure 8.12 > Selected global gas trade flows in the New Policies Scenario (bcm)



Note: C&S America = Central and South America.

Source: IEA WEO 2017

Price differences between once isolated regions now qualified as 'spreads'

Whilst in the past one spoke about more or less isolated regions where respective prices would not or barely influence each other (e.g. Asia, USA, Europe), today such price differences are qualified as 'spreads'. 'Spread' is a trading term: One qualifies price differences as spreads if they are tradable by price arbitrage. In a world with destination flexible LNG responding to price signals this is the case. The spreads form the basis for commercial decisions of an LNG-supplier whether a delivery from 'A to B' is commercially more attractive than a delivery from 'A to C'.

The effect can be seen on the IEA chart below: An increasing convergence of prices, to a considerable extent achieved through the price spread arbitrage just mentioned.

Figure 1.2 • Gas price development, 2012-17



Note: NBP = National Balancing Point (United Kingdom).

Sources: NBP, Henry Hub, Japan LNG contract and Brent data: Bloomberg Finance LP; Asian LNG spot data: ICIS (2017a), ICIS LNG Edge, www.icis.com/energy/liquefied-natural-gas/lng-edge (subscription required).

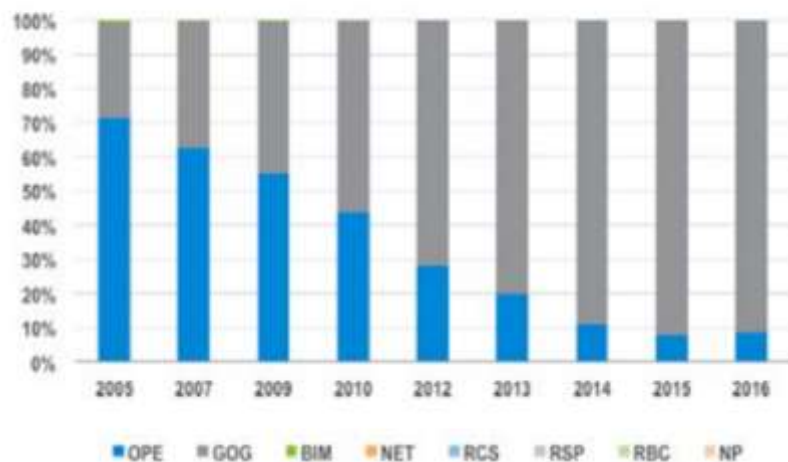
Source: IEA Global Gas Security Review 2017

Do the benefits of a global gas market also apply to Europe?

If there is an increasing quantity of LNG supplies which is destination flexible and responding to price signals, there are two questions: is the European market capable of sending price signals and, if so, would it be capable of absorbing such LNG supplies thus attracted? The answer to both questions is yes.

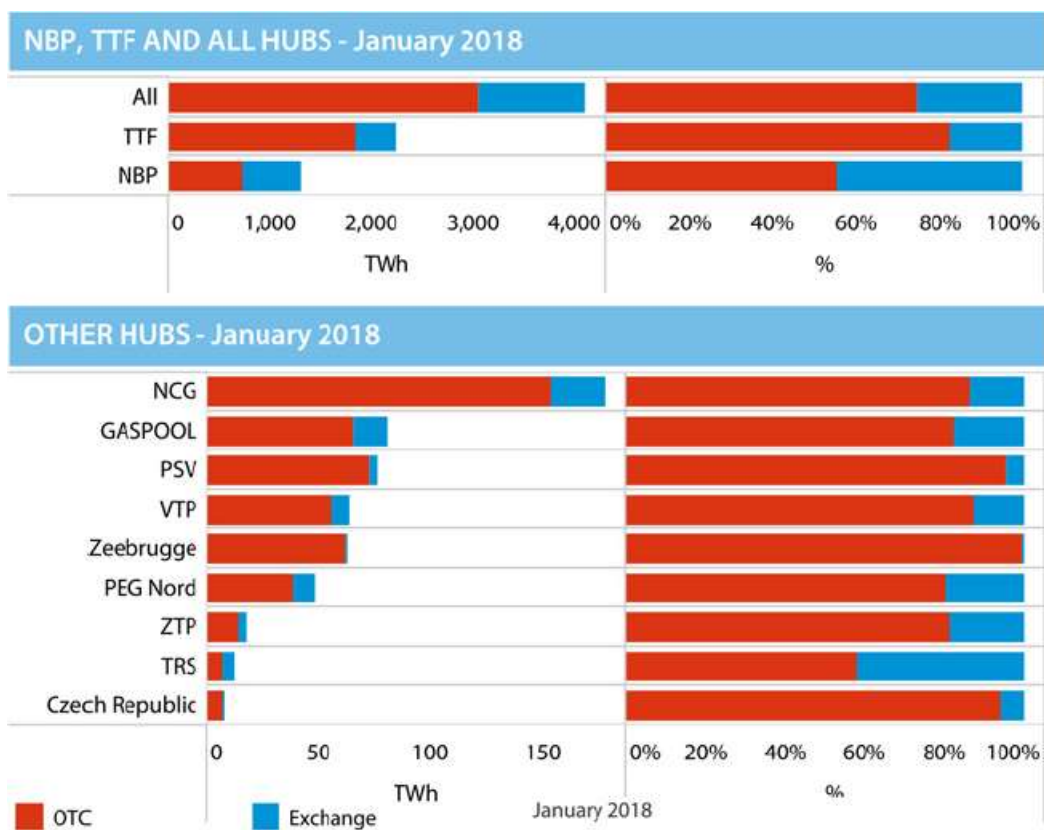
Europe has developed liquid traded markets, in which price formation is determined by supply and demand. The 'Wholesale Gas Price Survey 2017' of the International Gas Union (IGU) observes for Europe as a whole an increase of gas-on-gas pricing (GOG) from 15% to 66% between 2005 and 2016 and a decline in oil indexation from 78 to 30%. Admittedly these numbers are not (yet) fit to proclaim the European Henry Hub. There are still, e.g. in Central Europe and Southern Europe, markets which do not avail of sufficiently liquid hubs. However, if one looks at the Northwest European gas market, one observes between 2005 and 2016 an increase of gas-on-gas pricing from 28% to 91% and a decline of oil indexation from 72 to 9%.

Figure 5.5 Northwest Europe Price Formation 2005 to 2016



Source: IGU Wholesale Gas Price Survey 2017 Edition

Moreover, the price level of the less liquid traded markets is usually strongly correlated (or even used for proxy pricing) to the deep and liquid Northwest European hubs, e.g. the NBP and the TTF, where the bulk of European gas trading is being transacted.



Source: ICIS Heren, EGM 25.03

In other words: Europe is definitely capable of sending price signals. To avoid any impression of theorizing (and thereby advancing part of the conclusion intended for the final section): If a shortage of pipeline gas, for which ever reason, occurs and, subsequently, demand exceeds supply, traded prices will rise. Such is a so-called price signal, which will be recognized by would-be LNG suppliers and to which they are likely to respond.

Europe is also capable of absorbing LNG deliveries attracted by the just mentioned price signals. Europe² avails of some ~210 bcm/a of regasification capacity, which has thus far on average only seen a 25% utilization.

KEY DATA			
Annual regasification capacity of large-scale LNG import terminals per country			
	billion m ³ (N)/year		
	operational	under constr.	planned
BELGIUM	9		
CROATIA			6
ESTONIA			5
FINLAND			
FRANCE	34		11
GERMANY			4
GREECE	5	2	6
IRELAND			3
ITALY	15		8
LATVIA			5
LITHUANIA	4		
MALTA	1		2
NETHERLANDS	12		4
POLAND	5		11
PORTUGAL	8		
SPAIN	69	3	5
SWEDEN	1		1
UK	48		17
TOTAL EU-28	210	5	87
ALBANIA			8
NORWAY			
RUSSIA			3
TURKEY	17		21
UKRAINE			10
TOTAL EUROPE	227	5	129
Number of LNG import terminals per type			
	operational	under constr.	planned
LARGE-SCALE	23	2	7
└ FSRU & OTHERS	4	0	13
SMALL-SCALE	5	4	4
TOTAL EUROPE	28	6	11

Source: GIE LNG Map 2018

Admittedly not all of the 28 terminals are geographically located such that they would benefit Europe in its entirety: E.g. Spain is traditionally 'LNG-country' with a multitude of terminals (69 bcm/a, see above), but unfortunately still not sufficiently interconnected with the other markets of the European continent.

Nonetheless, about half of the terminal capacity would be capable of absorbing LNG supplies, which would also benefit the Eastern European gas markets directly.

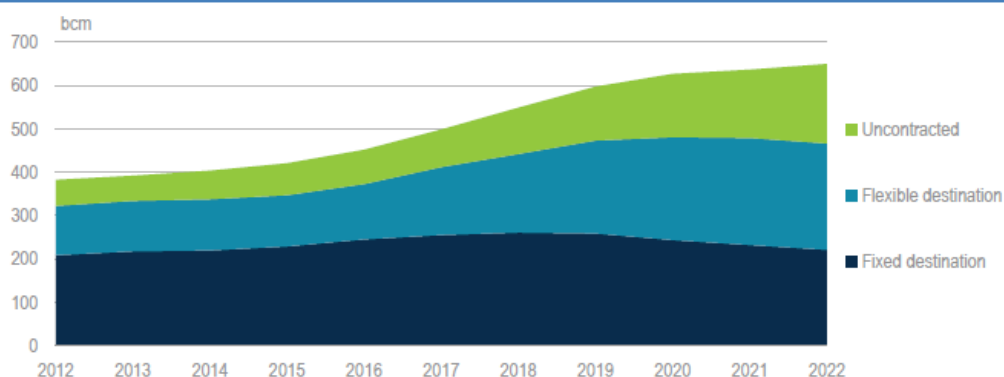
² Without Turkey.

Availability of LNG in case of need

It remains to be explored whether LNG would, in case of need, indeed be available within a reasonable period of time. The answer is affirmative.

The share of LNG quantities with fixed destination has been decreasing significantly. This trend will be further amplified though the actions taken by the Japanese Ministry of Economy, Trade and Industry (METI) against destination clauses. In contrast, volumes with flexible destination have been rising and continue to do so. Moreover, volumes not contracted at all, i.e. instantly available for spot transactions, are also rising significantly.

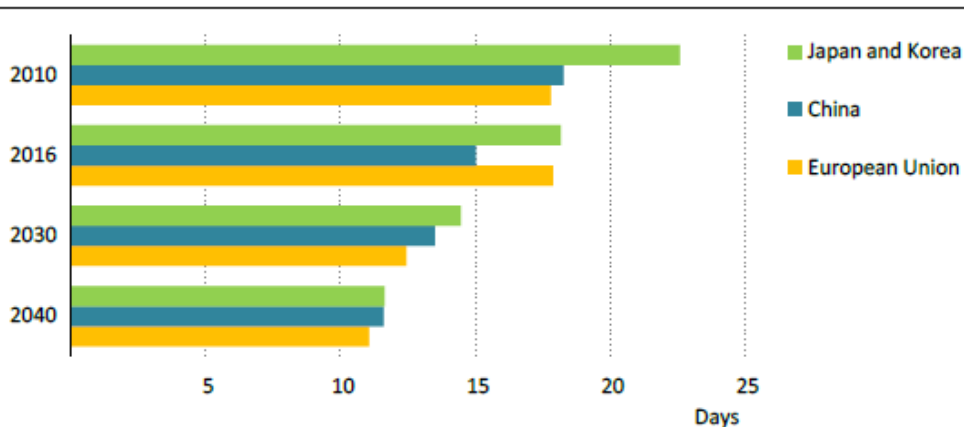
Figure 2.10 • LNG export contract volumes by destination flexibility, 2012-22



Source: IEA Global Gas Security Review 2017

Also the response time, i.e. the period between a price signal received and the arrival of the physical cargo has been reduced significantly and will get even shorter: The IEA projects for Europe a reduction of the response time from about 17 days in 2016 towards some 12 days in 2030. A period which, in case of a pipeline supply shortage, can ordinarily be bridged by storage withdrawals.

Figure 9.14 ▸ Estimated average time to procure an extra 10% of LNG import volumes by selected importer in the New Policies Scenario



As LNG trade expands and becomes more diversified, major LNG importers are able to meet an unforeseen 10%-spike in their LNG import demand in much less time than today

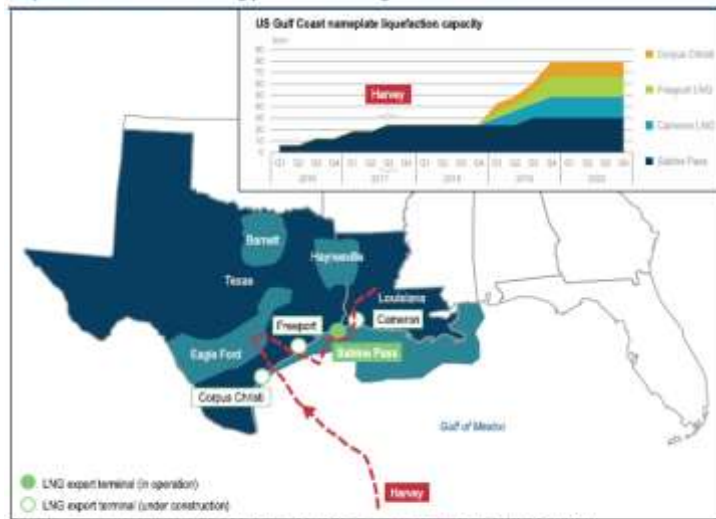
Source: IEA WEO 2017

Diversification remains nonetheless indispensable

Despite the blessings of the global gas market, diversification of supply sources and transport routes as well as ensuring sufficient and effective interconnectivity remain indispensable. This is emphasized by the IEA in its second 'Global Gas Security Review' published in 2017. The dynamic development of the global gas market creates new interdependencies and thus also the possibility of unexpected shocks.

E.g. the IEA points towards the developing concentration risk of US American export terminals at the Gulf Coast: The Gulf Coast is from time to time affected by hurricanes, e.g. last year hurricane 'Harvey'. It would thus be unwise to rely exclusively on US American LNG.

Map 1.2 • US Gulf Coast increasingly connected to the global LNG market



Sources: EIA (2017a), Natural Gas Consumption by End Use (database), www.eia.gov/total/ng/ng_cons_sum_doc_sla_a.html, EIA (2017b), Natural Dry Gas Production (database), www.eia.gov/energyexplained/data/us%20dry%20state%20gas%20production.php, ICIS (2017a), ICIS LNG Edge, www.icis.com/energy/liquefied-natural-gas/lng-edge (subscription required).

Source: IEA Global Gas Security Review 2017

As an example for lack of vigilance towards sufficient interconnectivity, the IEA mentions Southern France: The sudden unavailability of a multitude of nuclear power plants in winter 2016/2017 resulted in a massive price spike in the TRS (the southern French gas hub), until LNG supplies arrived and leveled the price delta.

Figure 1.5 • Natural gas spot prices in France versus TTF and LNG spot price in Spain, winter 2016/17



Sources: Natural gas prices in France: Bloomberg Finance LP; other prices: ICIS (2017a), ICIS LNG Edge, www.icis.com/energy/liquefied-natural-gas/lng-edge (subscription required).

Source: IEA Global Gas Security Review 2017

The Nordstream 2 debates in context: much ado about nothing

The Nordstream 2 political (and regulatory) debates are a good example for ignoring market developments and clinging to old paradigms and prejudices.

US sanctions to foster US LNG supplies? - Money talks, not sanctions!

E.g. the USA, whose gas economy is decisively forging the development of the global gas market as described, deem it appropriate to impose sanctions on Nordstream 2 and those firms supporting it. The obvious motive is the aspiration to foster the supply of US American LNG to Europe³.

From the above observations it should be clear however that sanctions are an entirely unsuitable instrument to enable the supply of US American LNG to Europe. Decisions whether such deliveries take place or not are exclusively commercial considerations based on the price spreads between the American Henry Hub (,HH') and the Northwest European traded markets (NBP, TTF).

Misplaced US sanctions: 'Money talks ...' – not sanctions



Premium NBP over HH required (Note: exemplary only!)

Full cost: 15% HH + ~\$2.50 liquefaction + 0.50 shipping + \$ 0.50 regas =

~\$3.95/MMBtu

Marginal cost (liquefaction sunk):

~\$1.70/MMBtu



Source: ICIS Heren

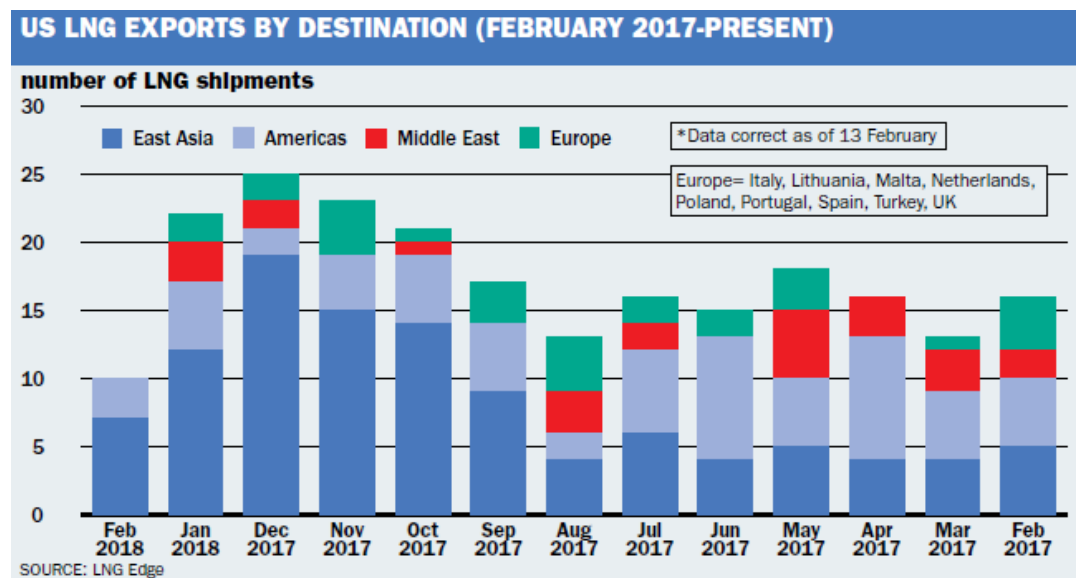
Source: ICIS Heren; own calculations

The zero line in the above graph - courtesy ICIS Heren - shows the necessary spread HH/NBP at which the LNG supplier - in this calculatory example⁴ - earns back his full costs of \$ 3.95 MMBtu (ca. 10.85 €/MWh). Above the zero line he earns additional margin and below the zero

³ The frequently alleged 'altruistic concern' for its NATO partners shall be addressed further down below.

⁴ The numbers can vary significantly depending on the situation of the respective supplier.

line he loses money. And even if he could make money with supplies to Europe, he would also look at the spreads with other markets, e.g. South America and Asia and would then decide for the destination where he can achieve the highest netback. The below graph with the track record of US LNG exports demonstrates this impressively.



Source: ICIS Heren, EGM 25.03

For Europe, this also means that LNG is the so-called marginal supply quantity, which sets the maximum price achievable for pipeline gas in Europe (i.e. a price 'cap' or 'ceiling'). Hence, as already indicated above, if a pipeline supplier would try to drive up prices or even curtail supply volumes, the subsequently rising traded prices would, with high probability, cause the arrival of LNG supplies.

If we take this train of thought one step further it means that high-volume pressure of pipeline gas in the European traded markets, also supplies via Nordstream 2, are prone to keep the price level of European traded markets so low that for lack of sufficiently large spreads US American LNG might not be delivered to Europe. The renowned ewi Institut has, in its report '*Impacts of Nord Stream 2 on the EU Natural Gas Market*'⁵ demonstrated this price dampening, 'end-user welfare effect' for Europe convincingly. This welfare effect even extends beyond Europe: each LNG cargo not delivered to Europe will be sent to other markets in the global gas market and has therefore e.g. also for Asia or South America a price dampening effect.

EC efforts to derail Nordstream 2: Trapped in paradigms of the past?

In this context, the efforts of the European Commission to change the third energy package such that it also applies to pipelines outside the territory of the European Union (clearly directed against Nordstream 2, but with considerable potential collateral damage to other pipelines) appears, to put it mildly, anachronistic. The European Commission must accept the rebuke that it has overlooked the global gas market developments described above or that it is - for other reasons - deliberately ignoring them.

⁵ ewi Energy Research & Scenarios gGmbH; www.ewi.research-scenarios.de

It is, unfortunately, correct, and has undoubtedly also severely damaged the reputation of the product natural gas at large, that gas supplies have in the past been misused as a political weapon. However, the so-called 'Putin-Phobia'⁶, as Professor Jonathan Stern so accurately characterizes the attitude of European policymakers towards natural gas in general and towards Russian gas in particular, is no longer appropriate. The once bilateral physical dependency regarding the supply of natural gas has transformed itself towards a functionality of price signals which leaves no room any more for political power games.



**Misplaced EC efforts to derail Nordstream 2:
SoS has transformed from bi-lateral physical dependency to a
functionality of price signals in an integrated traded market**



Ukrainian Crisis 2009: Andrej Budajew, "Putin's recalcitrant bride"

23

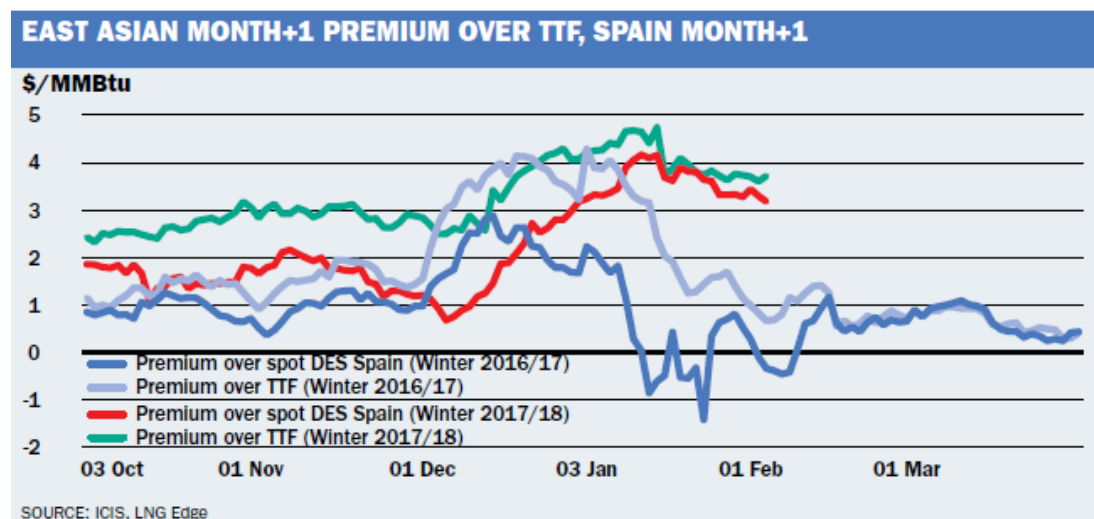
In a distinguished Gas Forum in December 2017 in Frankfurt a high-ranking American civil servant asked the question whether we believed that the Russian President might consider to use energy supplies as a means to exert political pressure. Various participants of the forum belabored the usual mutual dependency ('we need their gas, they need our money'). There was, however, also a statement quite in line with the above description of the global gas market: This may be so. Only, nobody has told him that it would not work anymore.

US sanctions out of 'altruistic concerns? Beware of your friends!

On the backdrop of Europe's attained immunity the frequently alleged 'altruistic concern only' of the US for its NATO partners reminds, in this context, of the saying 'I know how to protect myself from my enemies, but help protect me from my friends.' Not only would the consequence of blocking large quantities of pipeline gas from competing diminish the aforementioned volume pressure on the European traded markets and hence elevate the price levels to the detriment of European end-users.

⁶ 'The future of gas in decarbonizing European energy markets: the need for a new approach', by Jonathan Stern, January 2017, OIES Paper NG 116, www.oxfordenergy.org

Rather, it would also mean that the European markets would have to compete *permanently* (instead of occasionally when markets are tight) for global LNG. The below graph from ICIS Heren demonstrates what that would have meant in winter 2017/2018, where China massively ramped up gas demand and prices skyrocketed. The required premium over the TTF price level to attract LNG cargoes away from Asia towards Europe averaged 4.12 \$/MMBtu (11.31 €/MWh) in January 2018. In other words, the M+1 settled TTF price in January 2018 of 20.288 €/MWh, and along with it the correlated traded prices throughout European traded hubs, would have had to be at ~31.598 €/MWh, i.e. more than 50% higher, to attract LNG supplies.



Source: ICIS Heren, EGM 25.03

Also absent unexpected spikes in demand as discussed above any proposition of a ‘concerned friend’ to block pipeline supplies from entering the European markets and competing, reveals itself as an ‘indecent proposition’ in the face of staggering numbers. This is not the place to analyze in detail the gas market of each European member state and fractionally diverging price levels. Suffice it to assume that by and large the price correlation of European markets has proven to stay mostly in sync to make the point: Conform Eurogas⁷ the EU-28 consumed in 2017 some 488.9 bcm or 5,280 TWh of gas. This means that, for each 1 €/MWh of elevated price level, the EU-28 gas bill would rise by 5.28 billion Euros, i.e. European end-consumers would stand to foot a potentially very large bill as a consequence of political brinkmanship.

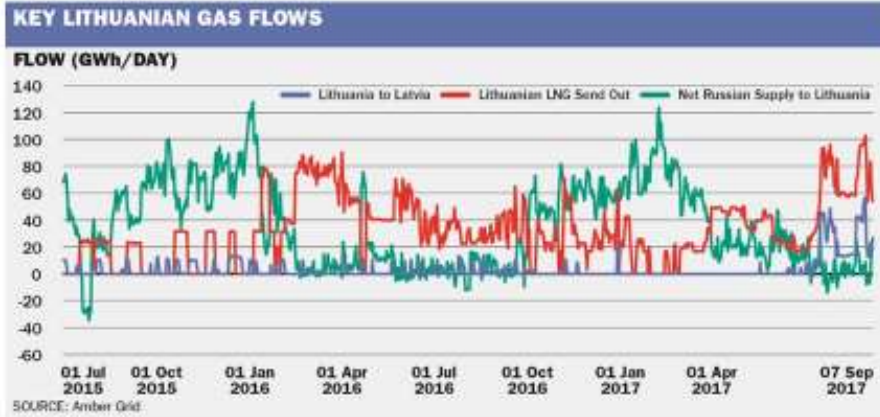
Market realities belie political brinkmanship

A good example for how market realities have changed and politicization is entirely unfounded is Lithuania. Not only have they liberated themselves from physical bilateral dependency through the construction of the Klaipeda LNG terminal. As the graph below – courtesy ICIS Heren – demonstrates, they have taken it one step further: arbitraging Russian supplies vs. attractive LNG spot purchase opportunities, and even using some of such supplies to fill the storage in Latvia.

⁷ Eurogas Press Release of 6 November 2017, ‘Higher gas demand in 2017 helps lower emissions’ (www.eurogas.org)



Misplaced EC efforts to derail Nordstream 2: E.g. Lithuania: arbitraging Russian gas vs. LNG Note: first US cargo 2017 (Cheniere) not a game changer



Source: ICIS Heren

24

Source: ICIS Heren

Also the political furor caused by 2 cargoes carrying Russian LNG from the Novatek/Total Yamal terminal which were delivered, after re-loading, to the Northeast US coast (Engie's Everett terminal near Boston) is a point in case for demonstrating that the days of political brinkmanship in conjunction with gas supplies are over.



A screenshot shows the Gaselys route from Europe to the US (VesselsValue)

Source: LNG World News 2/5/2018 (www.lngworldnews.com)

The title of a respective article in ICIS Heren⁸ is befitting: “*Russian gas deliveries to the US this winter highlight the realities of a globalized LNG market rising above political agendas*”.

Conclusion

In conclusion it appears appropriate to redefine conventional gas economical paradigms. This applies also and in particular to the definition of security of supply. In a world of destination flexible LNG responding to price signals the mere availability of such creates a ceiling for the price of pipeline gas in the European traded markets and hence renders concerns about potential political blackmail obsolete. Also Nordstream 2 supply quantities are not a threat, but would rather significantly contribute to the volume pressure on European traded markets, which would keep the price level low for the benefit of European end-users. The ceiling effect of the destination flexible LNG of the global gas market ensures that this continues to be the case.

Muelheim, Germany, in February 2018

⁸ ICIS Heren, EGM 25.02, page 21