



Implications of US LNG on Gas Pricing

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Ralf Dickel
Mobile: + 49 173 713 8976
e-mail: dickel.ralf@t-online.de

UNGA resolution 1803 of 1962

- The General Assembly declares that: The right of people and nations to permanent sovereignty over their wealth and resources must be exercised in the interest of their national development and of the wellbeing of the people of the state concerned.”

- Subject to abiding by international law

=>resource owner countries are free to decide on export volumes and price (and will try to maximize revenues)

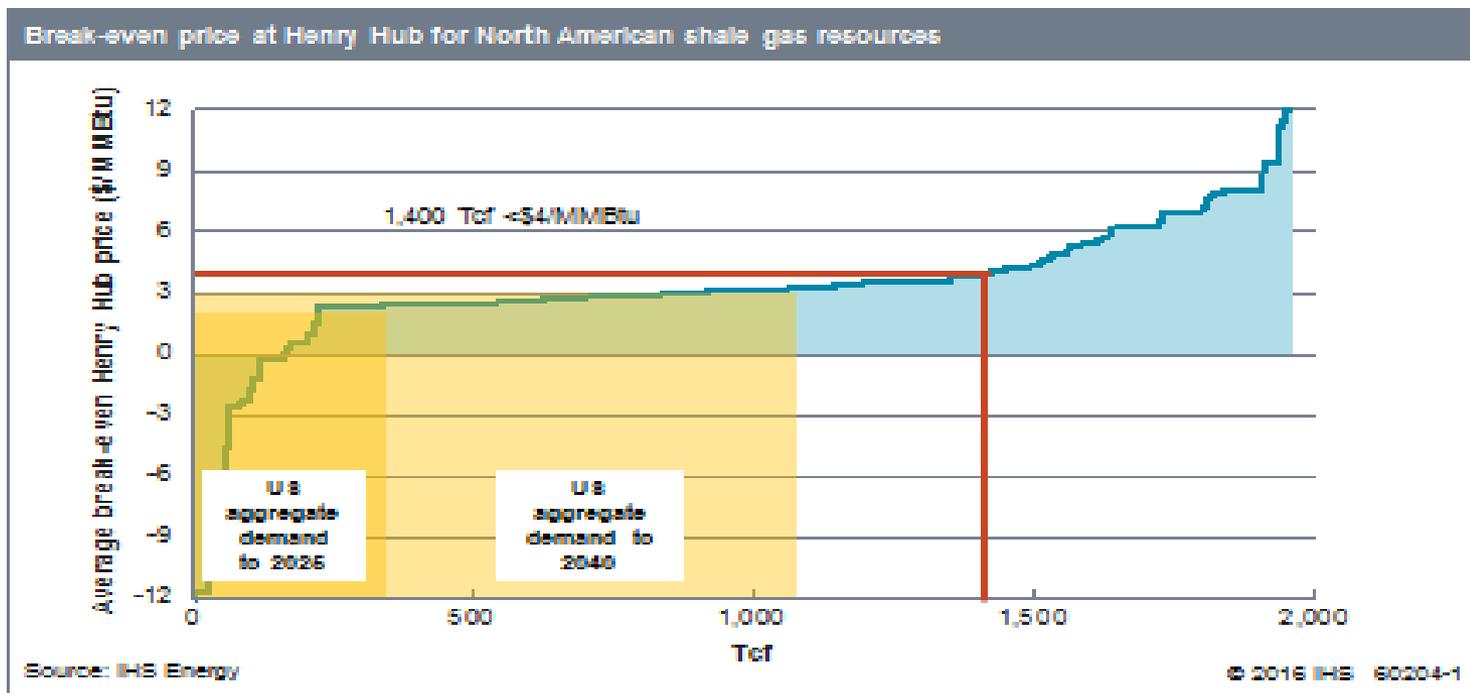
BUT

- keeping contracts
- subject to realities of competition and markets

US gas: infinite production at $\leq 4\text{ \\$}/\text{MMBTU}$?



How long does \$4 gas last in North America?



US shale production

- HH (Henry Hub) not the lowest price in US
- Hub plus transport to liquefaction / purification costs
- Coal prices East coast (also rail freight)
- Lower costs for gas as byproduct
- At present prices capital destruction
- As long as capital destruction no new liquefaction
- If liquefaction costs covered, no limit to US production
- Further cost reduction?

Points of competition for gas / implications for LTCs and price review

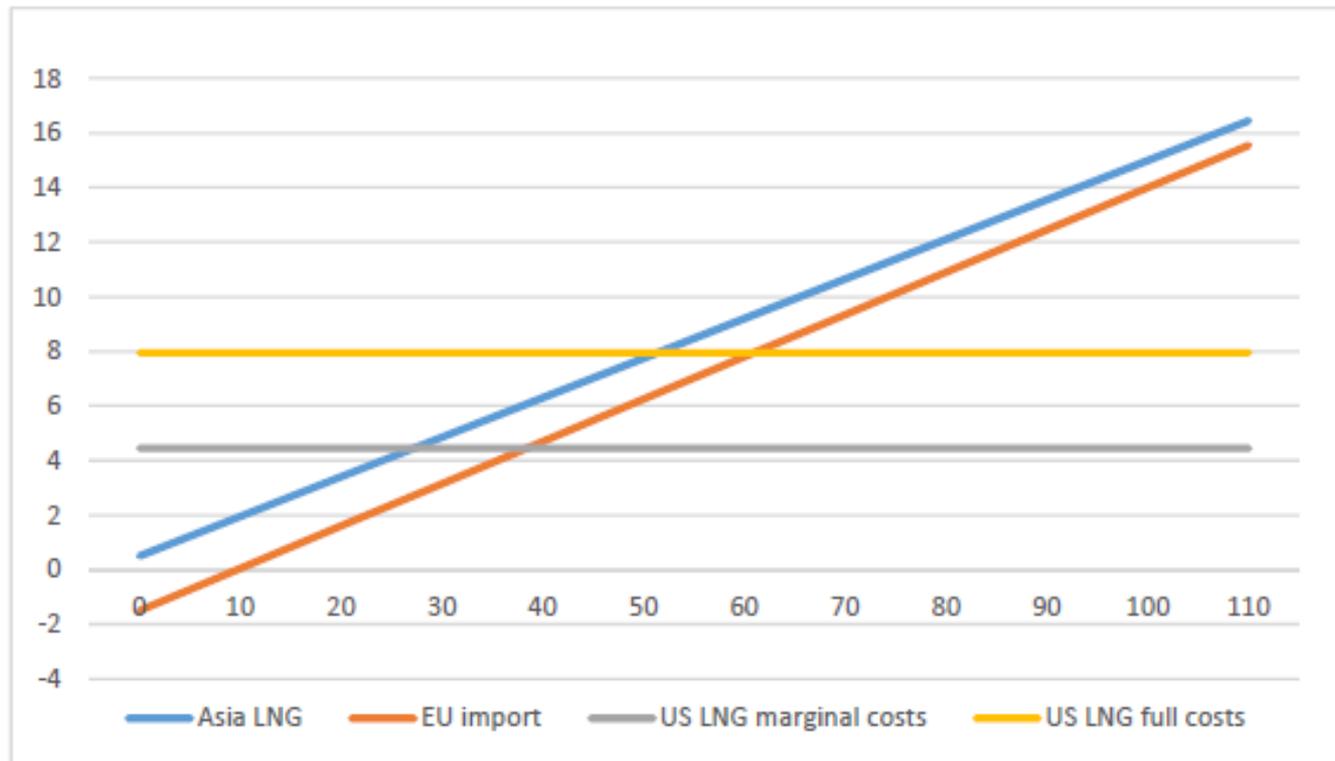
- on a market place on international territory or in international waters (Rotterdam/ Singapore or daisy chain in oil, possible for LNG?); review not useful
- at the entry to the country (JKT with JCC, or other Asia); review – if any - with landscape clause
- on a market place in the country / region (hub pricing, US, EU), LTCs possible; what review would make sense?
- at the final customer (net back/ replacement value); classic review: value of the gas, in any case marketable (where?) special case: landscape clause

Competitiveness

- HH plus marginal / full costs of LNG transport sets a price limit
- Crude oil / fuel oil pegging may be lower
 - than HH plus full costs => capital destruction (liquefaction, regas and LNG tankers)
 - than HH plus marginal costs => stop burning money
- Coal price as market clearing price for gas (in US and internationally)
 - Exporting price relation gas to coal from US?
 - Only if costs along chain for gas < for coal

US LNG vs Oil formula (indicative)

\$/MMBTU



\$/bbl\$/bbl

Export of US situation by LNG to EU?

- US gas delivery
 - HH + full costs of LNG chain (HH+15% fuel for liquefaction +3 \$ /MMBTU tolling fee+1,0 \$/MMBTU tanker+0,5 \$/MMBTU regas)
 - But not less than HH + variable costs (HH +15% for liquefaction fuel plus tanker rate 1,0 \$/MMBTU, assuming liquefaction invest and regas invest is sunk)

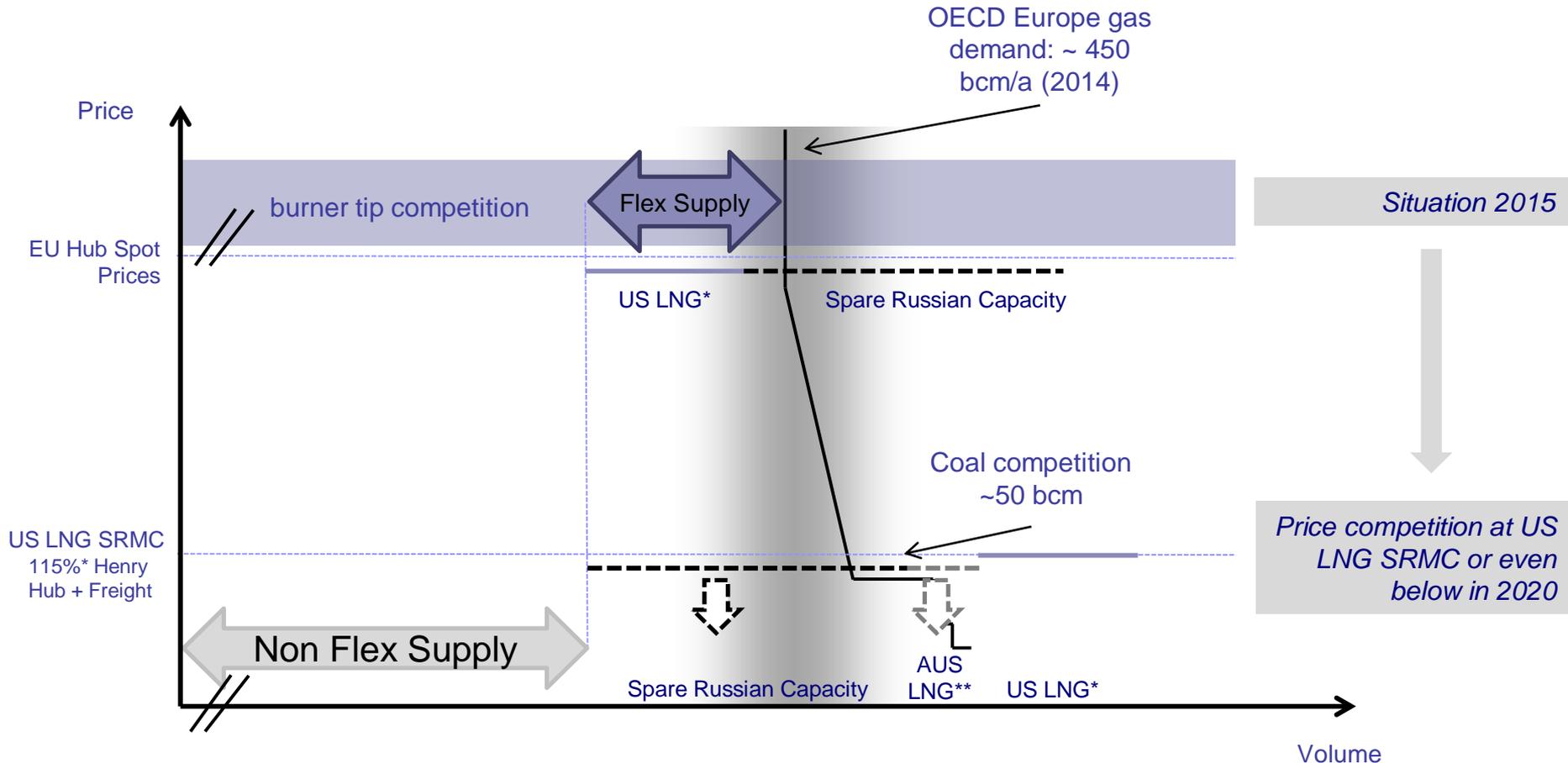
- Export of US competitive situation gas vs coal:
 - HH reflects at least coal / gas parity within US
 - Marginal costs of LNG export not higher than costs of coal export (shipping at 10 -15 \$/ long ton or 0.4 – 0.6 \$/MMBTU (coal) or 0.6 – 0.9 \$/MMBTU (corrected for gas/ coal efficiency) US East Coast to Rotterdam)
 - Domestic (intra EU) pipeline transport of gas to power plant not higher than coal by barges or rail

Question*: coal cheaper than gas?

Indicative costs elements of coal, LNG and gas to NWE							
Coal (US - NWE)				LNG (US - NWE)		Russian pipeline gas to NWE	
	Powder	Appalachia					
	\$/t	\$/t	\$/MMBTU		\$/MMNTU	\$/1000m ³	\$/MMBTU
production costs	15	50				production	15 0,45
royalties (max10%)	1	n.a.				upstream tax	10 0,30
rail to East coast	35	n.a.				Ru transport	70 2,10
at export point	50	50	2,50	Market at HH (incl 12.5% royalty)	2,50	export tax	28,5 0,86
				15% fuel liquefact	0,38	Nordstream	30 0,90
				Liquefaction	3,00		
Shipping + harbour		15	0,75	Shipping	1,00		
				regas	0,50		
		variabl	3,25	variable	3,90	variable	1,16
		fixed	0,00	fixed costs	3,50	fixed	3,45
		total	3,25	total	7,40	total	4,80
of which:		royalty max 0,05		royalty	0,25 - 0,30	resource tax	1,16

* This chart is to trigger discussion. Figures in it are guesstimates only

LNG Oversupply Might Bring EU Gas Prices down to SRMC of US LNG Export (Illustrative)



SRMC = Short Run Marginal Costs
 50% of new liquefaction capacity (~50bcm)
 **Conservative approach (~20bcm)