

Understanding the current strengths and future competitiveness of European Gas

Gas Storage Perspective

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Gas storage demand drivers

negative impact

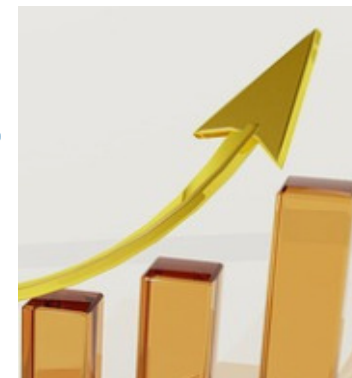
- warm winter and increasing annual mean temperature
- gas less favourable as a generation fuel
- declining demand for heating gas
- availability of other flexibility sources, such as:
 - gas hubs
 - pipeline flexibility
 - LNG

positive impact

- higher Min-take obligations in Russian LTC lead to reduction of flexibility supply?
- production cut Groningen field 2016 again under review
- increasing security of supply (SoS) requirements?
- higher s/w spreads due to more LNG supply in Europe in the summer?

Additional storage capacity 2010-2015

Published storage investments



year	Country	storage name	storage type	gas type	company	WC (mcm/day)	WGV (bcm)
2011	A	7 fields	Depleted field	H-Gas	RAG/E.ON Gas Storage	22	1.733
2011	A	Aigelsbrunn	Depleted field	H-Gas	RAG Energy storage	1	0.130
2014	A	Nussdorf/Zaglin	Depleted field	H-Gas	RAG Energy storage	1	0.117
2011	A	Haidach	Depleted field	H-Gas	RAG/Wingas/Gazprom	12	1.200
2013&15	F	Saline / Etrez expansion	Salt cavern	H-Gas	Storengy	93	0.000
2014/15	F	Izaute/Lussagnet expansion	Aquifer	H-Gas	TIGF	8	0.200
2011	D	Epe E.ON expansion	Salt cavern	H-Gas	E.ON Ruhrgas AG	0	0.235
2013	D	Epe Essent Exp. / GEC	Salt cavern	L-Gas	RWE GS	10	0.168
2012	D	Epe KGE	Salt cavern	H-Gas	Kommunale Gasspeicher Epe	5	0.085
2012	D	Epe Eneco	Salt cavern	L-Gas	Eneco	10	0.100
2012-15	D	ESE Etzel (EGS/OMV/VNG/Gas-Union)	Salt cavern	H-Gas	E.ON Gas Storage	53	1.967
2012/13	D	Etzel Crystal (EnBW+EDF)	Salt cavern	H-Gas	FSG Crystal	14	0.398
2012	D	EKB Etzel (BP/DONG/Gazprom)	Salt cavern	H-Gas	EKB Storage	17	0.700
2013	D	Jemgum-1	Salt cavern	H-Gas	EWE AG	6	0.172
2012	D	Katharina	Salt cavern	H-Gas	Erdgasspeicher Peisen	2	0.106
2011/12	D	Kraak expansion	Salt cavern	H-Gas	E.ON Hanse GmbH	10	0.288
2012	D	Krummhörn expansion	Salt cavern	H-Gas	E.ON Ruhrgas AG	2	0.125
2014	D	Stassfurt expansion	Salt cavern	H-Gas	RWE GS	28	0.294
2015	NL	Bergermeer	Depleted field	H-Gas	TAQA/EBN/Dyas/Suncor	57	4.100
2012	NL	Zuidwending	Salt cavern	L-Gas	Energy Stock	43	0.300
2012	UK	Holford (formerly Byley)	Salt cavern	H-Gas	E.ON Gas Storage UK	22	0.168
2014	UK	Stublach	Salt cavern	H-Gas	E.ON Gas Storage UK	11	0.100
Sum						425	12.686

Source: GSE storage map 2010-2015

Germany: BMWi study indicates overcapacity

- SoS in the German gas system depends on the storage filling level

		60% filling level		
		No external effects	Technical problems	Russian Em bargo
February 2016 Withdrawal capacity	in %			
	Normal winter	72%	66%	39%
	Cold spell	20%	5%	-40%
	Cold winter	41%	28%	-63%
		+ = overcapacity - = undercapacity		

		30% filling level		
		No external effects	Technical problems	Russian Em bargo
February 2016 Withdrawal capacity	in %			
	Normal winter	61%	51%	-62%
	Cold spell	-19%	-45%	-133%
	Cold winter	-42%	-68%	-149%
		+ = overcapacity - = undercapacity		

Germany: BMWi study expectation for 2026

- Similar market situation in 2026
- No major changes of storage capacities till 2026
 - Similar SoS situation expected as in 2016



*Has there ever been
an industry sector
supporting its over-
capacity for 10 years?
Is it imaginable that
SSOs will be first?*

Germany: Federal Ministry of Economics (BMWi) is reviewing SoS support measures



- SoS standard in Germany is very high
- Further measures like strategic reserves or filling obligations are only necessary if a 100% risk avoidance is required.
- Suggested more market based measures are:
 - Revision of balancing regime; higher fee for imbalance
 - Reducing Demand in case of SoS issue by improving Demand-Side-Management

> Consultation procedure went until July 2015; final decision to be announced in October 2015

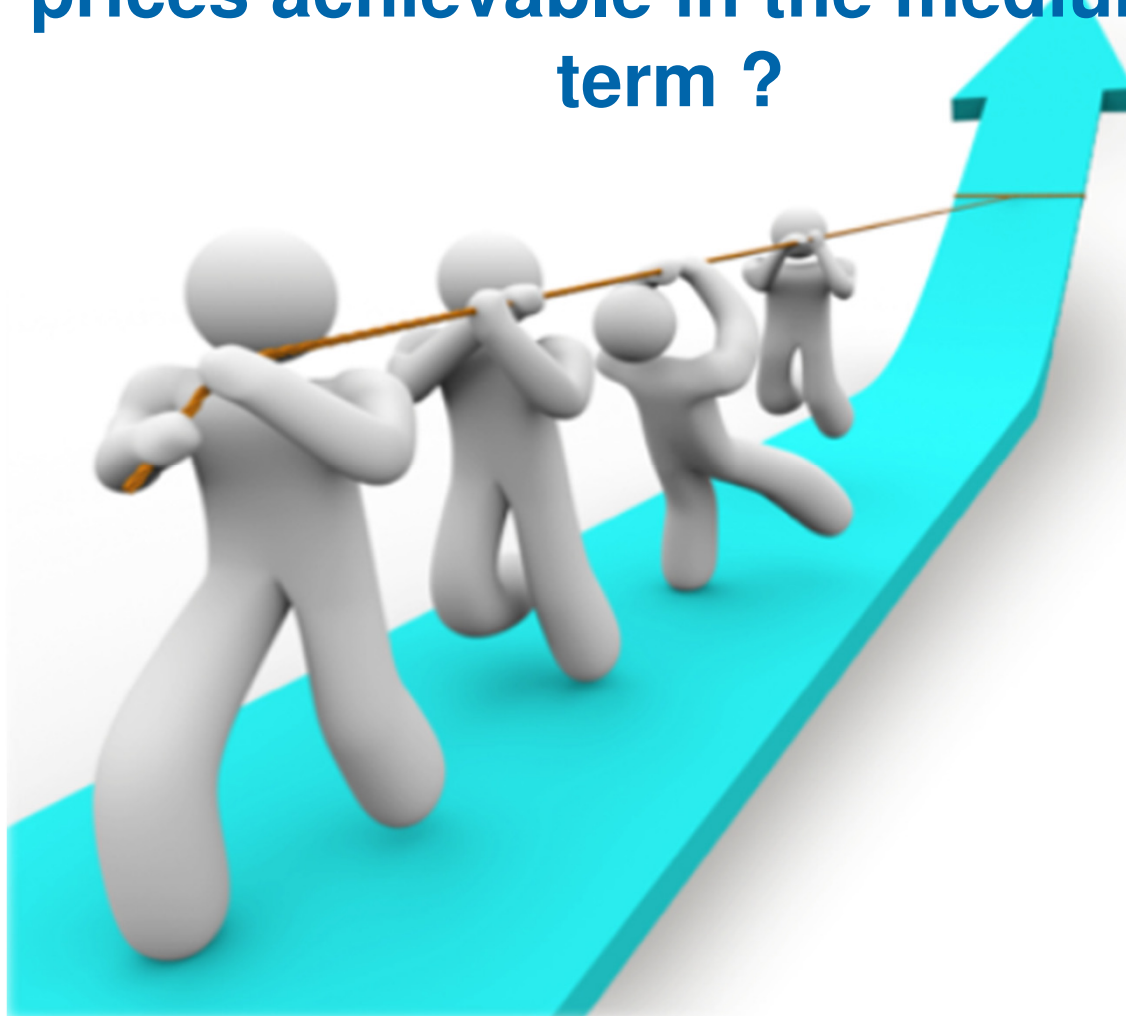
Results DG ENER study on SoS



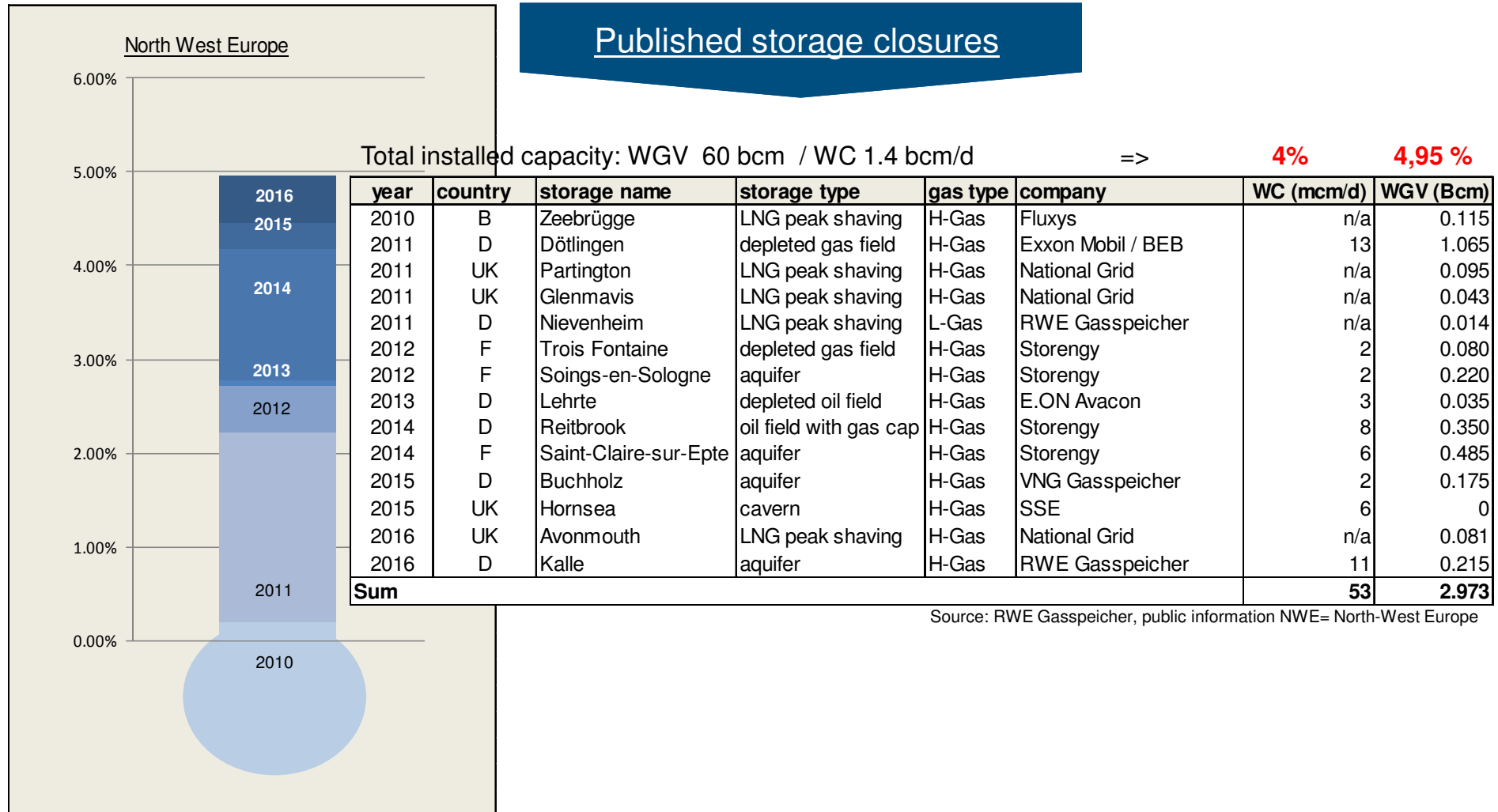
- Storage filling levels continuously high despite low seasonal spread & spot price volatility and increasing competition of flexibility sources
- So far no market failure has been noticed
- **strategic gas reserve:** Natural gas reserve far more costly than oil reserve.
- **storage measures:** partly effective, costs normally exceed benefits
- **Ignored insurance value may lead to reductions of storage capacity and of their usage in the future**
- **Advice to internalize insurance value:**
 - as a penalty for suppliers in case of disruptions or
 - as incentives and premiums offered for physical or virtual storage

Gas Storage Perspective:

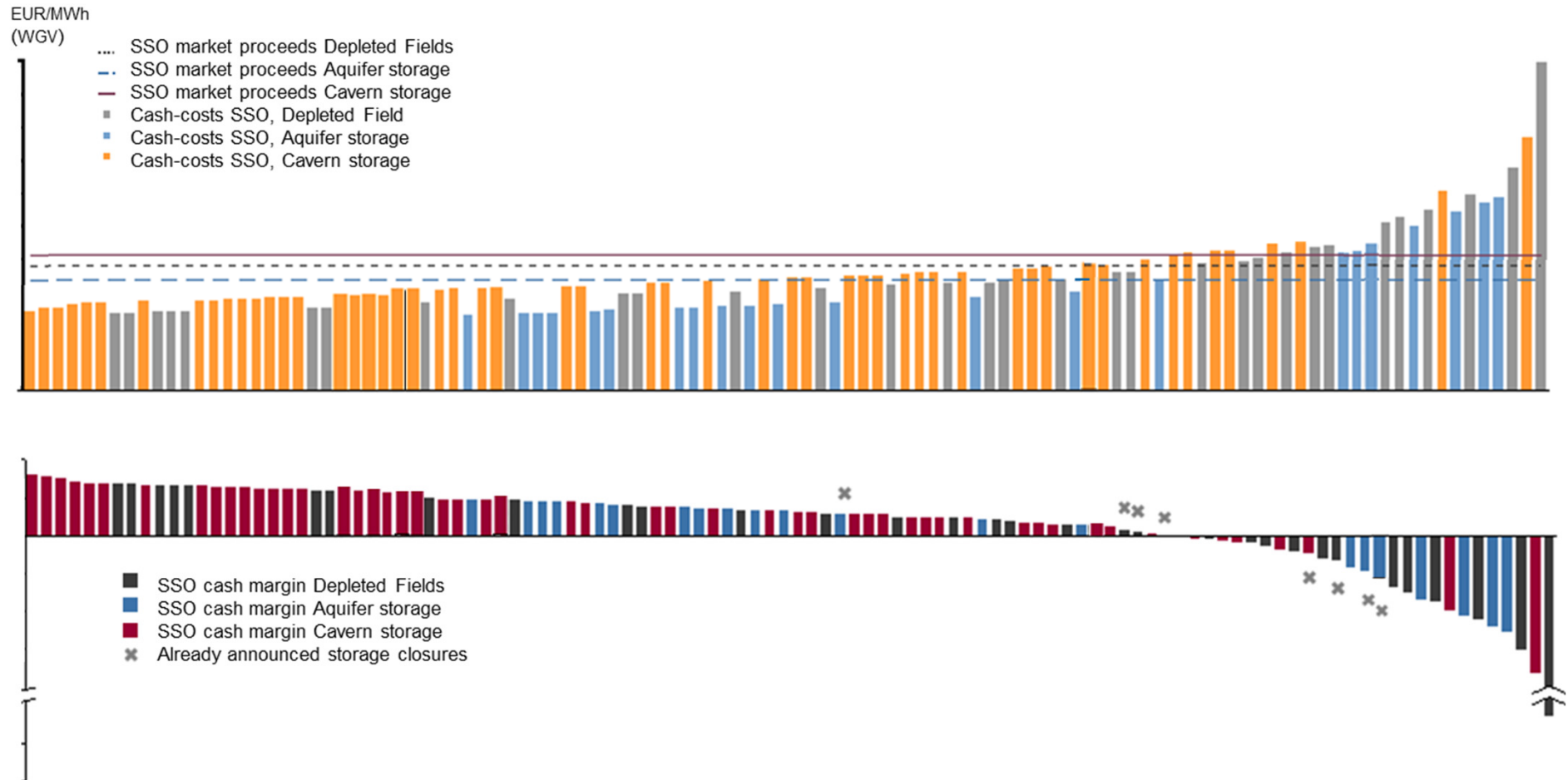
Higher prices achievable in the medium and long term ?



Reaction of storage operators in Northwest Europe



Not all storages are covering operational costs...



Source: RWE Gasspeicher, public storage data

Additional SoS for L-Gas achievable

- Gas quality requirement for L-Gas in Germany and L-Gas (respectively Groningen Gas) in the Netherlands are different: Wobbe-Index
 - GER: 39.6 – 46.8 MJ/Nm³
 - NL: 43.1 – 44.8 MJ/Nm³ (permitted range GTS border to Germany near Gronau/Epe)
- Harmonised gas quality requirements on both sides would:
 - enhance cross-border flows in both directions
 - simplify cross-border facility usage e.g. for storages
 - increase flexibility of L-Gas-Systems and add a positive impact on SoS

Challenges for L-Gas – The Netherlands

Where are we coming from?

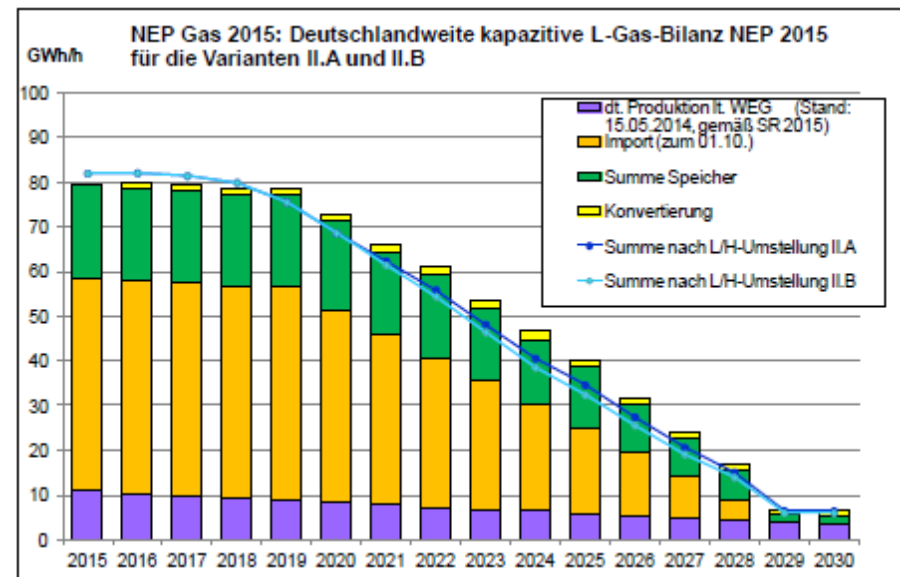
- Supply of end customers, power plants and industrial customers with Groningen gas (L-Gas) in NL
- Export of L-Gas to Germany, Belgium and France
- Export of flexibility out of the gas production to Germany

What has been changed?

- Growing number of tremors around the Groningen field
- Structuring of the production by gas storages already implemented
- Production cuts:
 - 2014 cut from 49 to 42,5 bcm
 - 2015 cut from 39,4 to 30 bcm
 - in 02/15 16,5 bcm for first half of 2015
 - in 06/15 13,5 bcm for second half of 2015

Niche market for L-Gas-Storages in Germany?

- L-Gas flexibility demand is covered by Dutch imports and declining German production
- Change from L- to H-Gas: Germany: Starts in 2015 and is scheduled until 2030
- German network development plan does not differentiate between market areas NCG and Gaspool yet
- Few L-Gas storages in NCG
- 30 bcm, including flexibility, to be replaced by H-gas by 2030



Source: NEP 2015, page 95

Conclusion

In any case, SSOs have to ...

- ... follow the discussion of the EU, National Governments and Regulators on future gas storage regulation
- ... foster transparency about correlation between availability of withdrawal capacity and working gas filling level
- ... check continuously cash flow balance and closing/mothballing options for gas storages to be prepared for cut throat competition
- ... use L-gas niche market opportunities

Security of supply will not be cheap forever!