Globalisation of LNG – How will Europe accommodate diversified LNG sources?

Gate terminal
Gas Access To Europe

ICIS
Amsterdam 19/10/2016
stefaan.adriaens@gateterminal.com , commercial manager

Globalisation of LNG – How will Europe accommodate diversified LNG sources?

- Tackling the challenges of quality and interoperability
- Understanding the technical and commercial challenges
- How could this impact the European LNG market?

Quality discussions date back to 2005, and even earlier (IUK:1998), so must be very important

Gate terminal
Gas Access To Europe

EASEE-gas

European Association for the Streamlining of Energy Exchange - gas

Common Business Practice

Number: 2005-001/02

Subject: Harmonisation of Natural Gas Quality

Approved:

EASEE-gas CBP 2005-001/01 has been approved by the EASEE-gas Executive Committee on 3 February 2005 and published on 7 February 2005. EASEE-gas CBP 2005-001/02 has been approved by the EASEE-gas Executive Committee on 6 November 2008.

...or isn't it?

Gate terminal
Gas Access To Europe

ommission suspends commor as quality proposals

European Commission has suspended its push t a new common gas quality standard in the EU, keswoman has confirmed.

ne commission's internal energy market director -Dieter Borchardt announced the decision at the id Forum on Friday.

arlier this year, the commission proposed to duce a new gas quality standard, called CEN, r the network code on interoperability and data ange. This code came into force in May and intended to remove technical and operational icles that hamper gas trading between transmis- systems.

urrently, gas within the different networks is of g standards because of the number of sources as originated from. As a result, the way countries ble to use this gas, right down to the design of ehold appliances, is designed according to the ent quality type within a certain country.

A common gas standard would therefore m whole technology structures across the bloc wo have to be overhauled.

Industry stakeholders had questioned the n for a new standard to be set, and said the new r would not be feasible to introduce across transmis system networks (*see ESGM 5 October 2016*).

Britain's National Grid had also said previously the new rules would mean up to one fifth of gas s plies to the UK would be refused entry to the Bri gas system (*see ESGM 15 September 2016*).

The Madrid Forum is attended by regulatory thorities, national governments, the commission, operators and other stakeholders every year. It platform to discuss evolving issues around the crea of an internal gas market.

This year, problems arising from implementatio the gas network codes over the past 18 months was to dominate the agenda. miriam.siers@icis.com

What is under discussion (not even Wobbe or variations)

Gate terminal
Gas Access To Europe

Parameter	Unit	Limits based on standard reference condition 15/15		Limits based on normal reference condition 25/0 (for information)		Reference standards for test methods[d] (informative)
		Min.	Max.	Min.	Max.	
Relative density	no unit	0,555	0,700	0,555	0,700	EN ISO 6976, EN ISO 15970
Total sulfur without odorant	mg/m^3	not applicable	20[a]	not applicable	21[a]	EN ISO 6326-5, EN ISO 19739
	For sulfur in high pressure networks and on interconnection points the maximum acceptable sulfur content for conveyance is 20 mg/m^3, where in high pressure networks non-odorized gas is current practice. However, for existing practices with respect to transmission of odorized gas between high pressure networks higher sulfur content value up to 30 mg/m^3 may be accepted. NOTE On distribution networks the odorization is considered as a national safety issue. Some information about sulfur odorant content is given in Annex B.					
Hydrogen sulfide + Carbonyl sulfide (as sulfur)	mg/m^3	not applicable	5[a]	not applicable	5[a]	EN ISO 6326-1, EN ISO 6326-3, EN ISO 19739

Parameter	Unit	Limits based on standard reference condition 15/15		Limits based on normal reference condition 25/0 (for information)		Reference standards for test methods[d] (informative)
		Min.	Max.	Min.	Max.	
Mercaptan sulfur without odorant (as sulfur)	mg/m^3	not applicable	6[a]	not applicable	6[a]	EN ISO 6326-3, EN ISO 19739
Oxygen	mol/mol	not applicable	0,001 % or 1 % (see below)	not applicable	0,001 % or 1 % (see below)	EN ISO 6974-3, EN ISO 6974-6, EN ISO 6975
	At network entry points and interconnection points the mole fraction of oxygen shall be no more than 0,001 %, expressed as a moving 24 h average. However, where the gas can be demonstrated not to flow to installations sensitive to higher levels of oxygen, e.g. underground storage systems, a higher limit of up to 1 % may be applied.					
Carbon dioxide	mol/mol	not applicable	2,5 % or 4 % see below	not applicable	2,5 % or 4 % see below	EN ISO 6974 parts 1 to 6, EN ISO 6975
	At network entry points and interconnection points the mole fraction of carbon dioxide shall be no more than 2,5 %. However, where the gas can be demonstrated not to flow to installations sensitive to higher levels of carbon dioxide, e.g. underground storage systems, a higher limit of up to 4 % may be applied.					
Hydro carbon dew point[b,c] at any pressure from 0,1 to 7 MPa (70 bar) absolute pressure	°C	not applicable	−2	not applicable	−2	ISO 23874, ISO/TR 12148
Water dew point[b,c] at 7 MPa (70 bar) or, if less than 7 MPa (70 bar), at maximum operating pressure of the system in which the gas flows	°C	not applicable	−8	not applicable	−8	EN ISO 6327, EN ISO 18453, EN ISO 10101 parts 1 to 3
Methane number	no unit	65	not applicable	65	not applicable	see normative Annex A
Contaminants	The gas shall not contain constituents other than listed in Table 1 at levels that prevent its transportation, storage and/or utilization without quality adjustment or treatment.					

[a] Figures are indicated without post-comma digits due to analytical uncertainty.

[b] Under given climatic conditions, a higher water dew point and hydrocarbon dew point may be accepted at national level.

[c] For further information on water dew point and hydrocarbon dew point see Annex C.

[d] Test methods other than those listed in the reference standards indicated in Table 1 may be applied, provided their fitness for purpose can be demonstrated.

Will the US LNG arrive: the answer is yes

Gate terminal
Gas Access To Europe

And that should not be a surprise as many LNG qualities already exist and arrive in Europe

Gate terminal
Gas Access To Europe

Origin	Nitrogen N2 %	Methane C1 %	Ethane C2 %	Propane C3 %	C4+ %	TOTAL	LNG Density (1) kg/m³	Gas Density (2) kg/m³(n)	Expansion ratio m³(n)/ m³ liq	Gas GCV (2) MJ/m³(n)	Wobbe Index (2) MJ/ m³(n)
Australia NWS	0.04	87.33	8.33	3.33	0.97	100	467.35	0.83	562.46	45.32	56.53
Australia Darwin	0.10	87.64	9.97	1.96	0.33	100	461.05	0.81	567.73	44.39	56.01
Algeria Skikda	0.63	91.40	7.35	0.57	0.05	100	446.65	0.78	575.95	42.30	54.62
Algeria Bethioua	0.64	89.55	8.20	1.30	0.31	100	454.50	0.80	571.70	43.22	55.12
Algeria Arzew	0.71	88.93	8.42	1.59	0.37	100	457.10	0.80	570.37	43.48	55.23
Brunei	0.04	90.12	5.34	3.02	1.48	100	461.63	0.82	564.48	44.68	56.18
Egypt Idku	0.02	95.31	3.58	0.74	0.34	100	437.38	0.76	578.47	41.76	54.61
Egypt Damietta	0.02	97.25	2.49	0.12	0.12	100	429.35	0.74	582.24	40.87	54.12
Equatorial Guinea	0.00	93.41	6.52	0.07	0	100	439.64	0.76	578.85	41.95	54.73
Indonesia Arun	0.08	91.86	5.66	1.60	0.79	100	450.96	0.79	571.49	43.29	55.42
Indonesia Badak	0.01	90.14	5.46	2.98	1.40	100	461.07	0.82	564.89	44.63	56.17
Indonesia Tangguh	0.13	96.91	2.37	0.44	0.15	100	431.22	0.74	581.47	41.00	54.14
Libya	0.59	82.57	12.62	3.56	0.65	100	478.72	0.86	558.08	46.24	56.77
Malaysia	0.14	91.69	4.64	2.60	0.93	100	454.19	0.80	569.15	43.67	55.59
Nigeria	0.03	91.70	5.52	2.17	0.58	100	451.66	0.79	571.14	43.41	55.50
Norway	0.46	92.03	5.75	1.31	0.45	100	448.39	0.78	573.75	42.69	54.91
Oman	0.20	90.68	5.75	2.12	1.24	100	457.27	0.81	567.76	43.99	55.73
Peru	0.57	89.07	10.26	0.10	0.01	100	451.80	0.79	574.30	42.90	55.00
Qatar	0.27	90.91	6.43	1.66	0.74	100	453.46	0.79	570.68	43.43	55.40
Russia Sakhalin	0.07	92.53	4.47	1.97	0.95	100	450.67	0.79	571.05	43.30	55.43
Trinidad	0.01	96.78	2.78	0.37	0.06	100	431.03	0.74	581.77	41.05	54.23
USA Alaska	0.17	99.71	0.09	0.03	0.01	100	421.39	0.72	585.75	39.91	53.51
Yemen	0.02	93.17	5.93	0.77	0.12	100	442.42	0.77	576.90	42.29	54.91

What can be done

Technically limited feasible options available:

-commingle or separate (at terminal or pipeline)

-nitrogen injection to reduce Wobbe to grid specification (or propane enrichment if you want to increase)

Commercially protection: specs

-country by country specifics reflected in contracts and probably in place for a good reason

Harmonisation needed?

-if you assume a Spanish gas molecule can enter a Dutch storage then e.g. O2 is an issue. Do you add constraints in Spain impacting l arge flows? Or relaxing a constraint that is probably also in place for some reason?

-or assume this is physically not going to happen or if it happens there is no real issue

An example: Netherlands

Maximum Wobbe in GTS grid: 55,7 MJ/Mm3

-Market adapted after long discussions to 55,7 (was 54)

-Nitrogen injection (to lower from up to 57,2)

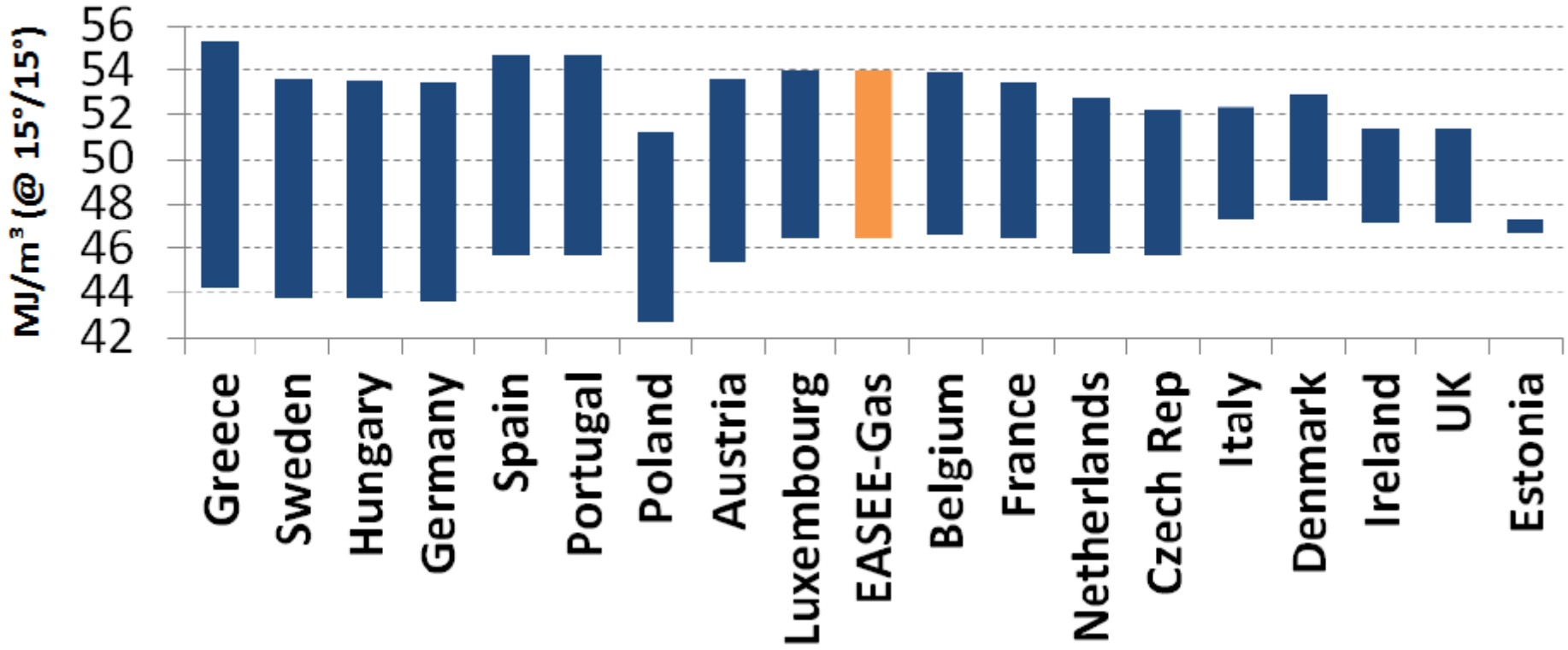
Minimum Wobbe: 49,9

-At very low flow, especially after unload, evaporated LNG (BOG)can be lean (Nitrogen evaporates preferentially). Blending pump to enrich BOG with a little LNG.

Harmonisation would be nice

Gate terminal

Figure 1 – Existing specification for Wobbe index



Source: GL Noble Denton. Note: This table includes gas specifications that cover L & H gas families

But the process creates a lot of uncertainty

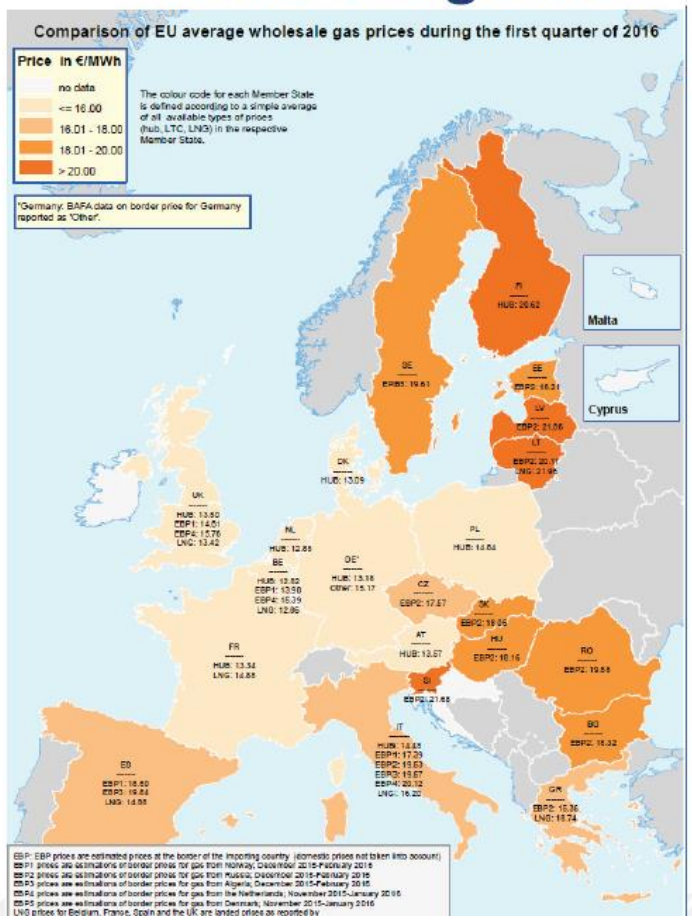
Contracts versus reality of gas/LNG

New sources

- Various US (some discussion around O2)
- Yamal

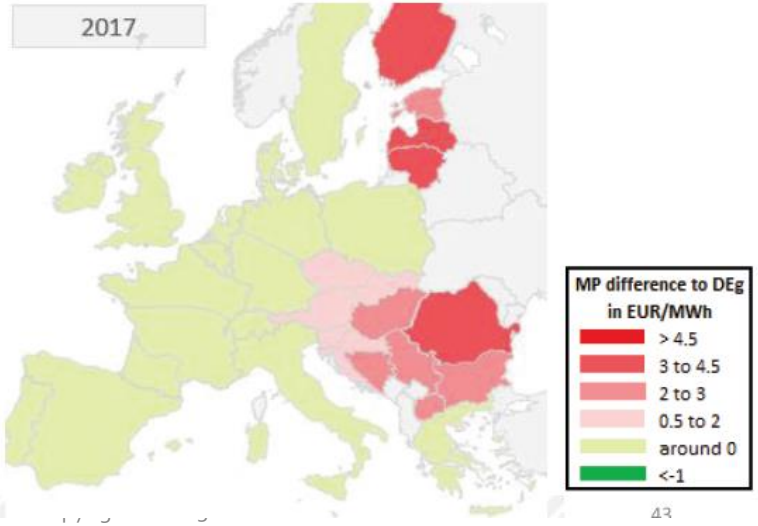
Anyway many locations available in an integrated market

Market integration - Price spreads



> Handled through a simulation focusing on Russian supply price information
  - Input: EC quarterly report Q1-16 EBP2 information (European Border Price: Russia)
  - Price spreads measured to German border price

> Marginal prices simulated for 2017



Looking downstream

Fuel market (ships/trucks):

- Methane Number (differs from Methane %)
- Variations
- Sulphur

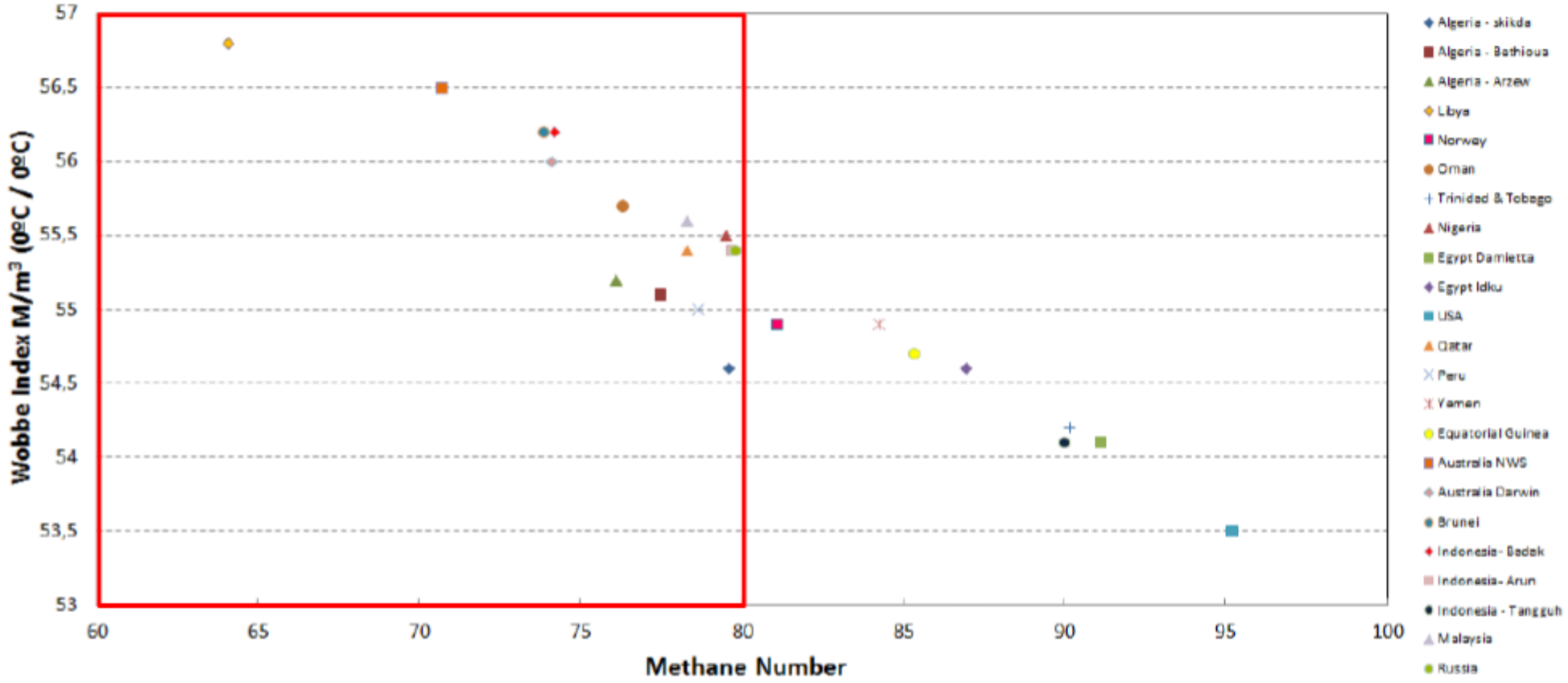
A lot of discussion but dust seems to have settled as the market evolves by giving information.

When Methane% is below 90% some customers start to voice concerns

Another discussion: Methane Number

Gate terminal
Gas Access To Europe

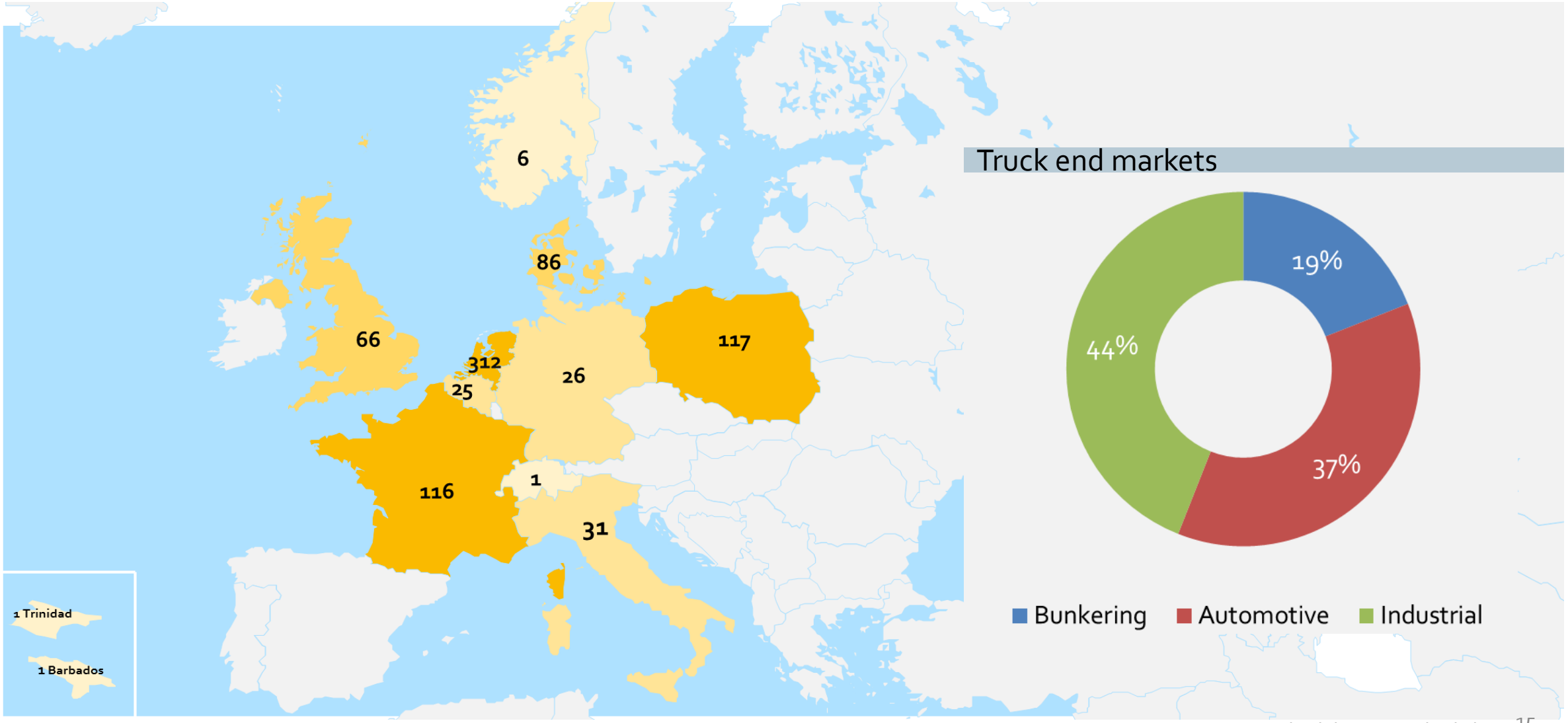
Figure 2: Methane Number (AVL Method) vs. Wobbe Index for LNG Sources during 2011



Source: GIIGNL 2011, The LNG Industry

Truck destinations across Europe 2015

Gate terminal
Gas Access To Europe



*Note: Some trucks deliver at multiple locations

In conclusion

Gas quality discussions are a headache:

- Some real legitimate concerns
- But enormous paper issues: not easy to solve

Gas quality will not stop LNG entering into Europe or stop LNG from being used as a fuel