Central and Eastern Europe Oil and Gas Markets
10 - 12 April 2017, Minsk, Belarus

Instytut
Studiów Energetycznych

Confidence
Capital

„Visegrad group oil and gas outlook”

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The information on which this presentation is based derives from our own experience, knowledge, data and research.

The opinions expressed and interpretations offered are those of Energy Studies Institute

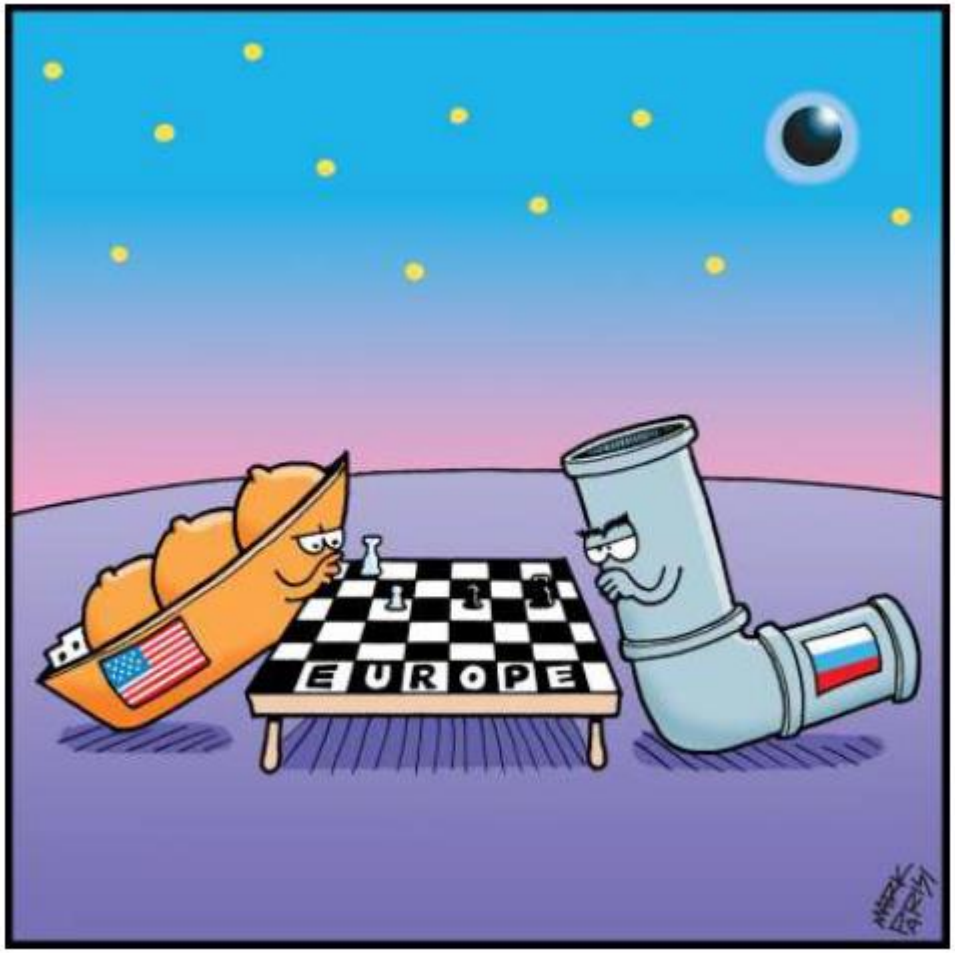
and have been reached following careful consideration.

However, the Oil&Gas business is characterized by much uncertainty and all of our comments and conclusions should be taken in that light.

Accordingly, we do not accept any liability for any reliance which our clients may place on them.

Agenda:

- ✓ European Energy Policy
- ✓ Crude oil deliveries
- ✓ Geopolitical risk
- ✓ How one can understand the prices of LNG i LPG on the European gas market
- ✓ Transparent infrastructure
- ✓ Conclusions



Sikora A., Sikora M., Quo vadimus?
CIRE: http://www.cire.pl/item,141968,13,0,0,0,0,0,quo-vadimus-.html
BIZNES ALERT: http://biznesalert.pl/quo-vadimus-lng-analiza/

Źródło: http://www.lupkipolskie.pl

European Energy Policy thus far, a framework for Security of supply

- Competitiveness
- Sustainable Development
- Secure energy

1st Strategic Energy Review

Energy and Climate Change Package

European Energy Programme for Recovery

(Regulation adopted)

New Infrastructure Instrument

Roadmap 2050

3rd SER

2nd Strategic Energy Review Action Plan

3rd Internal Energy Market Package

(adopted)

Oil Stocks Directive

(adopted)

Regulation on Security of Gas Supply

2007 Mar

2008 Nov.

2008 Dec.

2009 June

2009 July

2010

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Infrastructure and Diversification - Energy security priorities

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Pomeranian pipeline key asset to prevent disruptions of supply along Northern Druzhba

- Flow on the Pomeranian pipeline can be reversed (capacity 34MTA)
- The pipeline from Rostock could be activated (6.9 MTA)
- Total crude oil supply to inland refineries would be 40.9 MTA
- Inland refining nameplate capacity is 39.9 MTA
- Rostock pipeline ~30% of refining capacity in Germany. German refineries must rely on transit through Poland

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Adria and TAL-IKL are the key systems to prevent supply disruptions on the southern Druzhba

- Adria (14 MTA) can supply the Szazhalombatta refinery and up to 3.5 MTA to Slovakia
- IKL (10 MTA) sufficient to supply the Czech refineries
- TAL (42 MTA) may not have enough capacity to fill up IKL unless supplies to Karlsruhe via SPSE are maximized
- Currently there is no option to guarantee 5.7 MTA to Bratislava

Possible solutions

•Odessa-Brody-Uzhgorod, if the cause of supply interruption is upstream of Brody

•Expansion of the Hungary-Slovakia link

•New line from Schwechat to Bratislava

•Reverse flow from Kralupy to Bratislava

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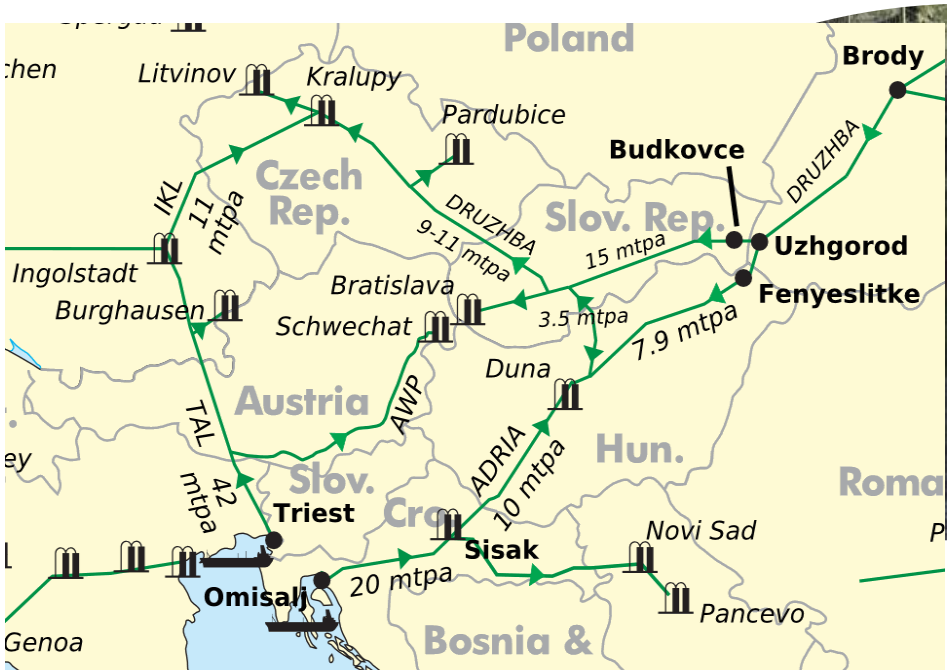
Bratislava – Schwechat has a commercial justification and makes a contribution to security of supply as well

- The distance between Bratislava and Schwechat is only 60km
- Oil prices along Druzhba normally lower than via TAL/AWP
- Good incentive to develop this project for commercial reasons
- Normal flow to Schwechat
- In absence of oil supplies to Bratislava flow could be reversed
- Flat landscape: lower construction costs

- AWP capacity (11 MTA) may limit crude availability to 1.5-3.0 MTA - AWP extremely difficult to expand

- TAL is a potential bottleneck if the pipeline needed at a time when Czech refineries are also in emergency



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V4 energy security: The land of nuclear and coal

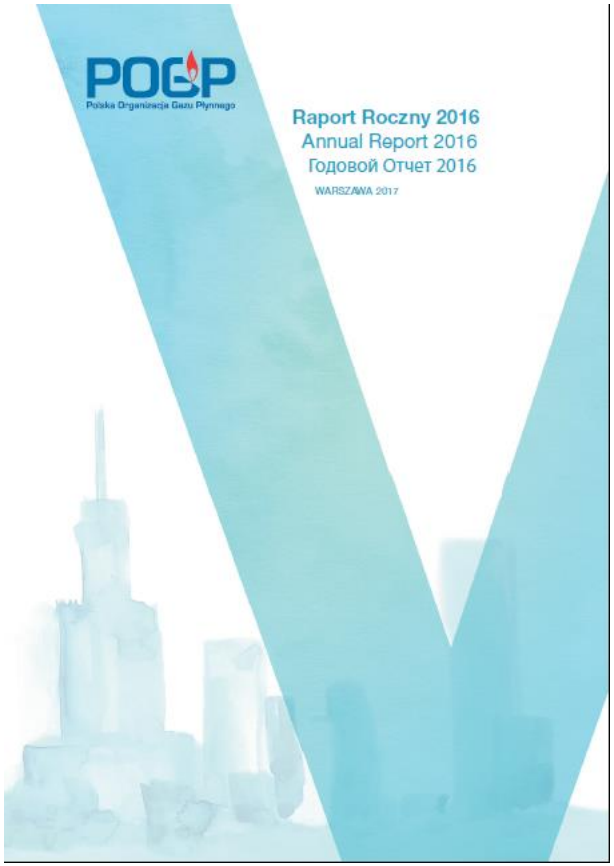
By Adéla Denková, Edit Zgut, Krzysztof Kokoszczy and Pavol Szalai | EURACTIV Czech Republic, EURACTIV Poland, EURACTIV Slovakia and Political Capital

16 mar 2017 (updated: 21 mar 2017)

Polish Presidency of the Visegrad Group
July 2016–June 2017

Source: http://www.euractiv.com/section/electricity/news/v4-energy-security-the-land-of-nuclear-and-coal/

DATA – source of information



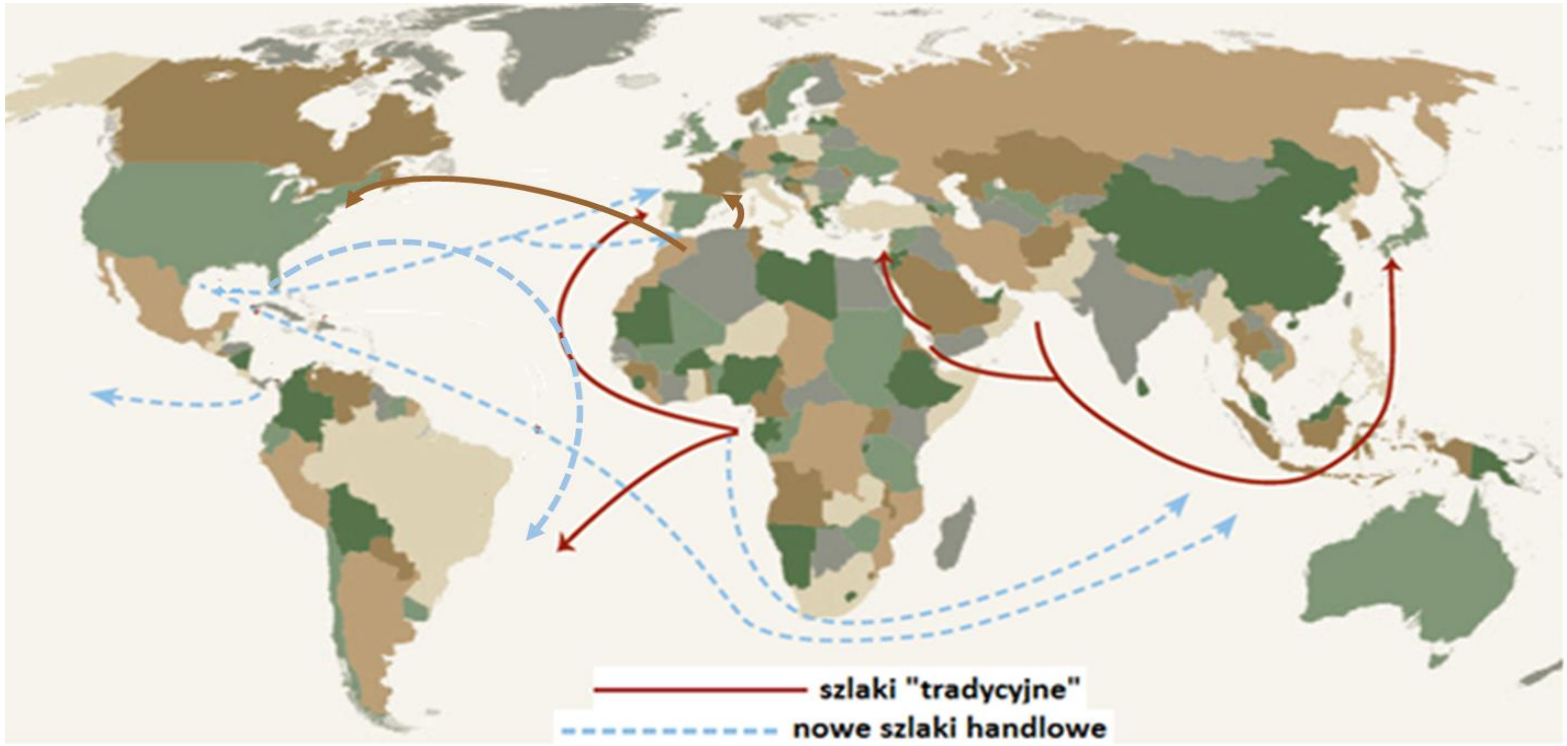
http://www.popihn.pl/raporty2.php

http://www.pogp.pl/mbsite/userUpload/raporty/raport_2016.pdf

CRUDE OIL - Operating environment in CEE in 2004/2016

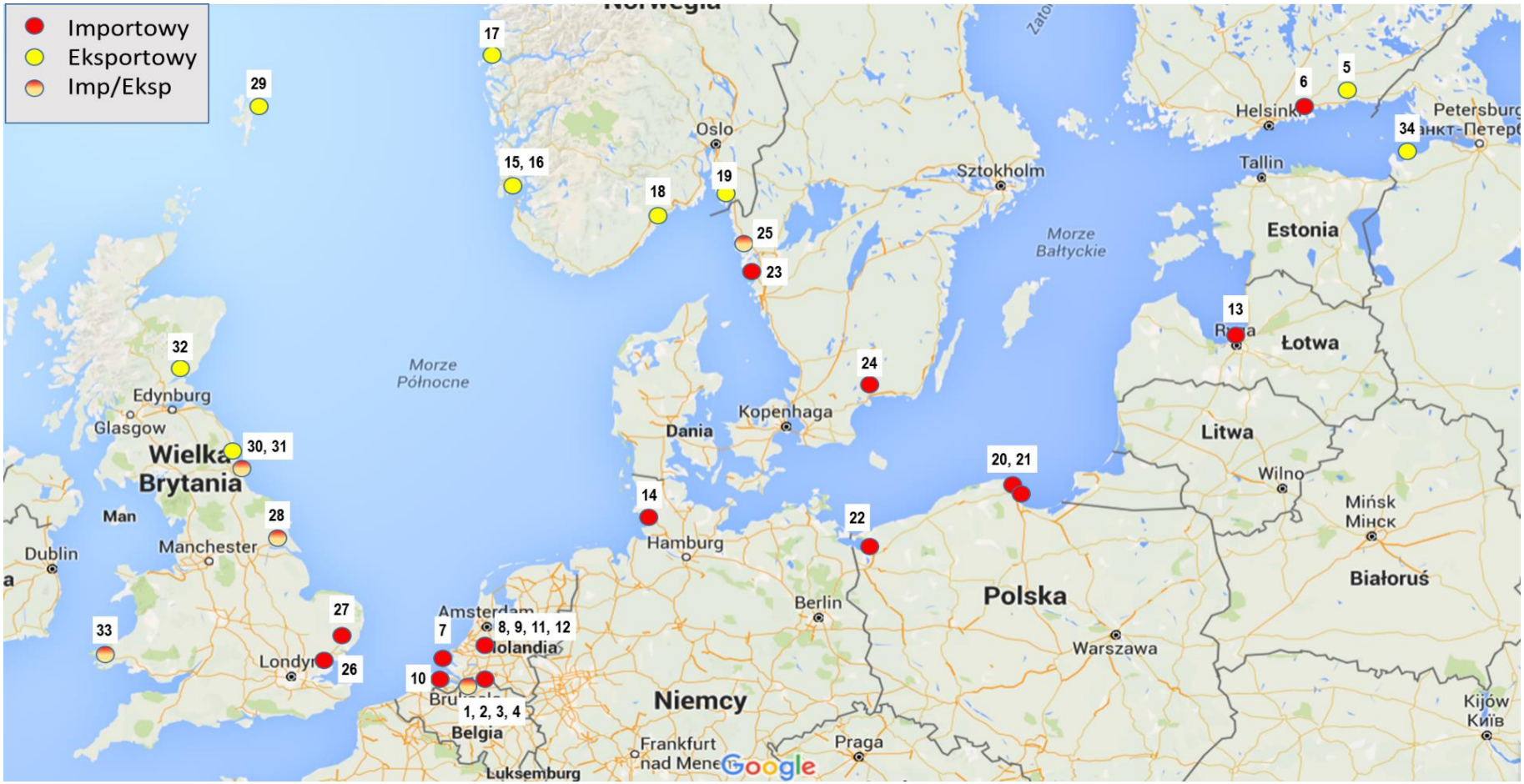
Źródło: Opracowanie własne.

LPG main routes and new flow

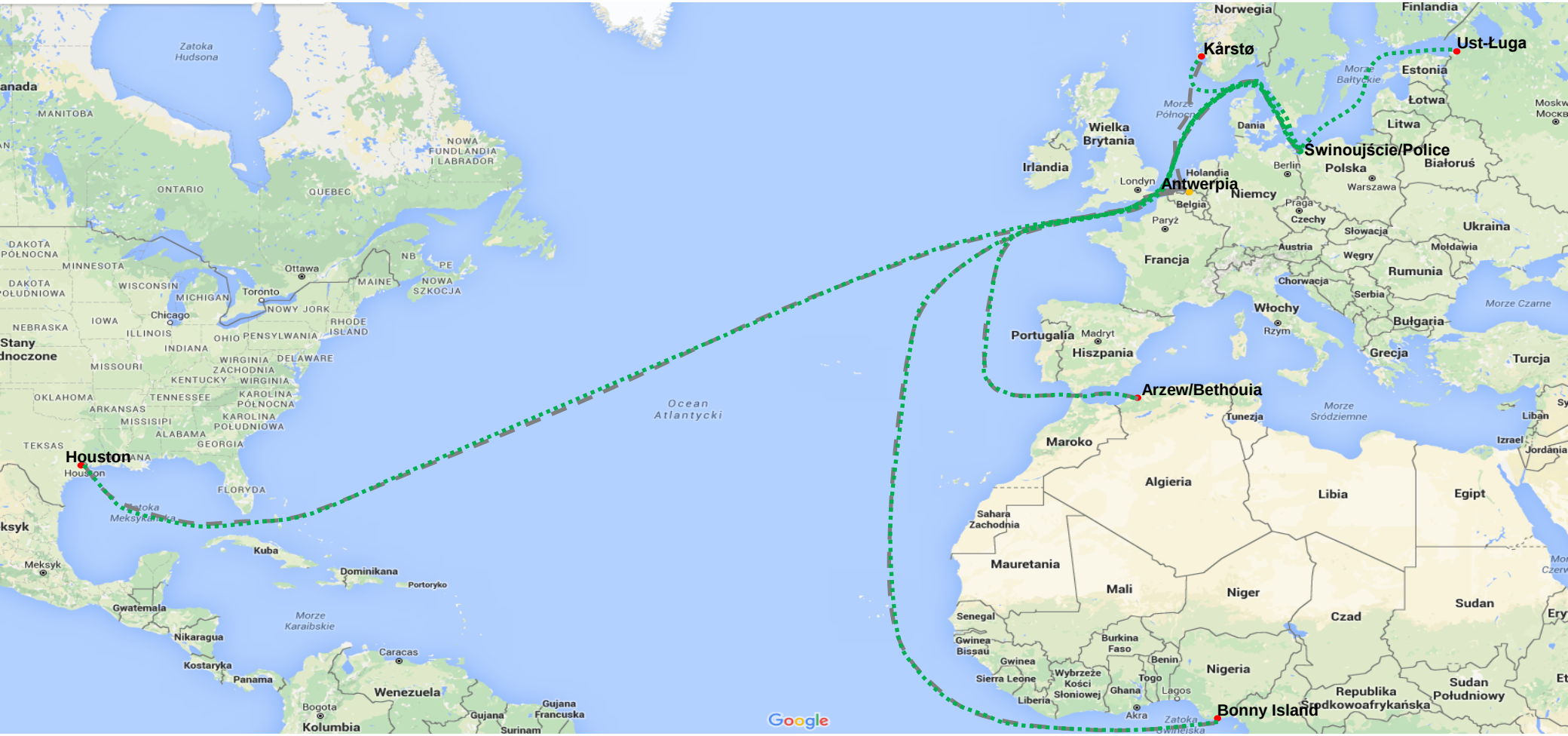


Międzynarodowy obrót LPG - morskie szlaki handlowe
Źródło: Opracowanie własne.

LPG Terminals in ARA region



Possible logistic option on the seas



- Terminal załadunkowy
- Terminal przeładunkowy (ARA)
- Terminal wyładunkowy
- Trasa z przeładunkiem
- Trasa bezpośrednia

Regional balance of the propane (LPG)

PODAŻ	2000	2005	2010	2015	2020	2025	2030
Europa Północna	9386	10512	9519	9505	8852	8419	7862
Europa Południowa	3869	3369	2839	2322	2289	2233	2177
Kraje b. ZSRR	5008	7618	9503	8371	9297	9685	11688
Podaż całkowita	**18263**	**21499**	**21861**	**20198**	**20438**	**20337**	**21728**
POPYT	2000	2005	2010	2015	2020	2025	2030
Europa Północna	6500	8061	8210	7960	7790	7620	7450
Europa Południowa	8450	8065	7682	7783	7566	7318	7171
Kraje b. ZSRR	3610	4833	6388	6587	7916	8994	9486
Popyt całkowity	**18560**	**20958**	**22280**	**22329**	**23272**	**23931**	**24108**
Nadwyżka/deficyt	**-297**	**541**	**-419**	**-2132**	**-2834**	**-3594**	**-2379**

PODAŻ	2000	2005	2010	2015	2020	2025	2030
Afryka Północna	5208	5240	4670	5470	6153	6847	7539
Nigeria	732	987	1484	1297	1170	1196	1313
Reszta Afryki	774	808	1300	1278	1505	1707	1828
Podaż całkowita	**6714**	**7035**	**7453**	**8045**	**8829**	**9750**	**10680**
POPYT	2000	2005	2010	2015	2020	2025	2030
Afryka Północna	294	493	710	1044	1216	1737	2029
Nigeria	2	7	7	145	156	162	615
Reszta Afryki	525	460	596	522	625	709	763
Popyt całkowity	**821**	**959**	**1314**	**1710**	**1997**	**2608**	**3407**
Nadwyżka/deficyt	**5893**	**6076**	**6139**	**6335**	**6832**	**7142**	**7273**

- Europe as a whole is a deficit market. Supply of refined propane decreases with the closure of the refinery, North Sea production also.
- **Russia develops LPG in petrochemicals.** The only continuously surplus country is Kazakhstan.

PODAŻ	2000	2005	2010	2015	2020	2025	2030
Stany Zjednoczone	35224	32636	35948	56039	69081	72977	74228
Kanada	6882	7244	6867	7185	7536	8020	8407
Ameryka Łacińska	12442	13719	13021	13576	14558	15239	16302
Podaż całkowita	**54548**	**53599**	**55836**	**76800**	**91176**	**96236**	**98937**
POPYT	2000	2005	2010	2015	2020	2025	2030
Stany Zjednoczone	40319	40417	39909	45808	51666	47986	50541
Kanada	2849	3679	4489	3576	4323	4495	4657
Ameryka Łacińska	17241	17435	17646	19694	21146	22913	24113
Popyt całkowity	**60409**	**61532**	**62044**	**69078**	**77136**	**75395**	**79311**
Nadwyżka/deficyt	**-5861**	**-7933**	**-6208**	**7722**	**14040**	**20842**	**19626**

- **Algeria will permanently export about 5 million of propane annually.**
- **Extraction of unconventional hydrocarbons entails the supply of huge amounts of NGL, including propane. Since 2012, propane exports from the United States have grown rapidly - already reaching 10 million tons per year.**

„Fully refrigerated"

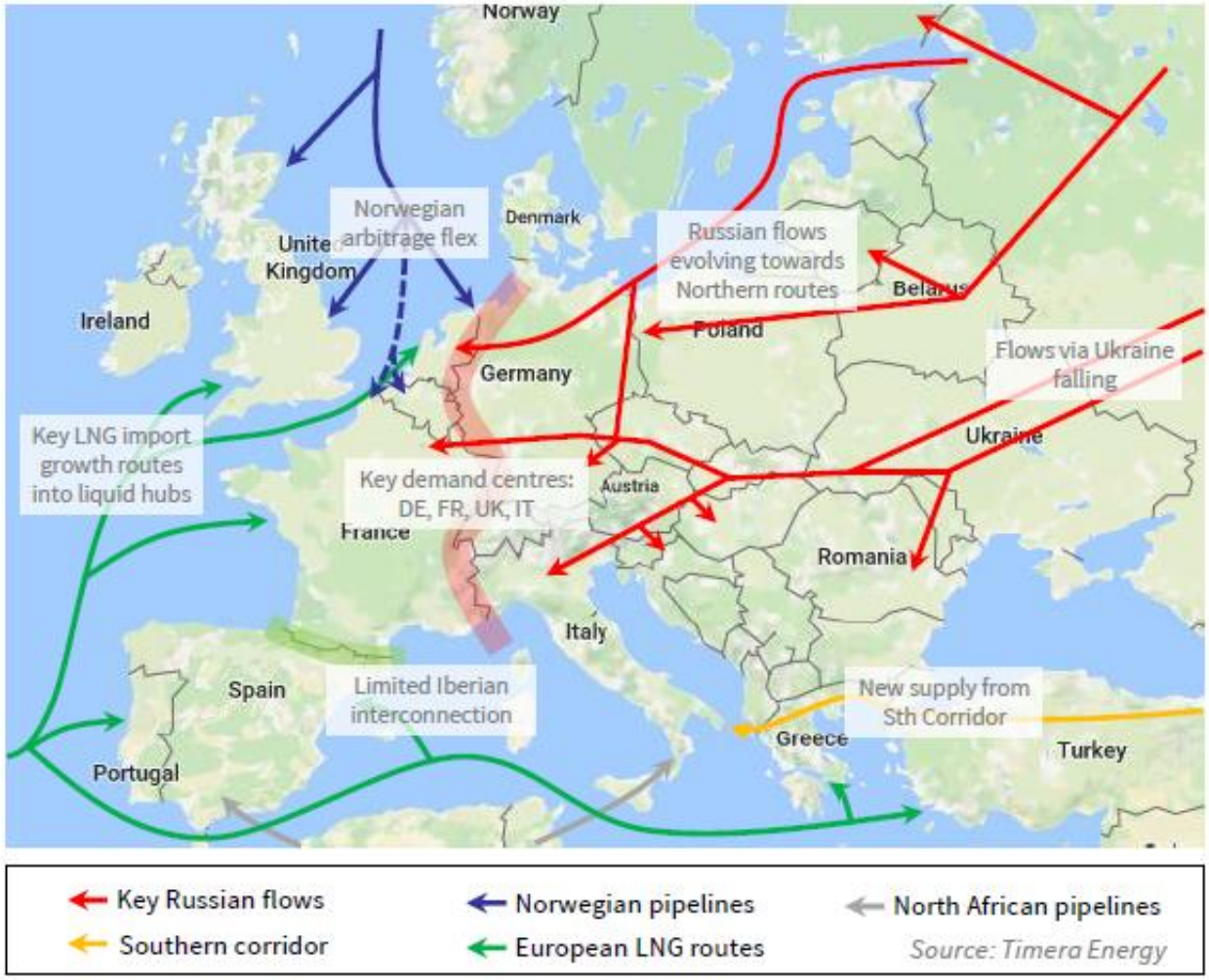
Clipper Sirius; Capacity: 75000 m^3; DWT: 54048 tonnes; Total length: 227 m; Immersion: 11.8 m; Min. Temperature: -50 ° C (may carry: LPG, **ammonia).**

Why is LNG market developing?

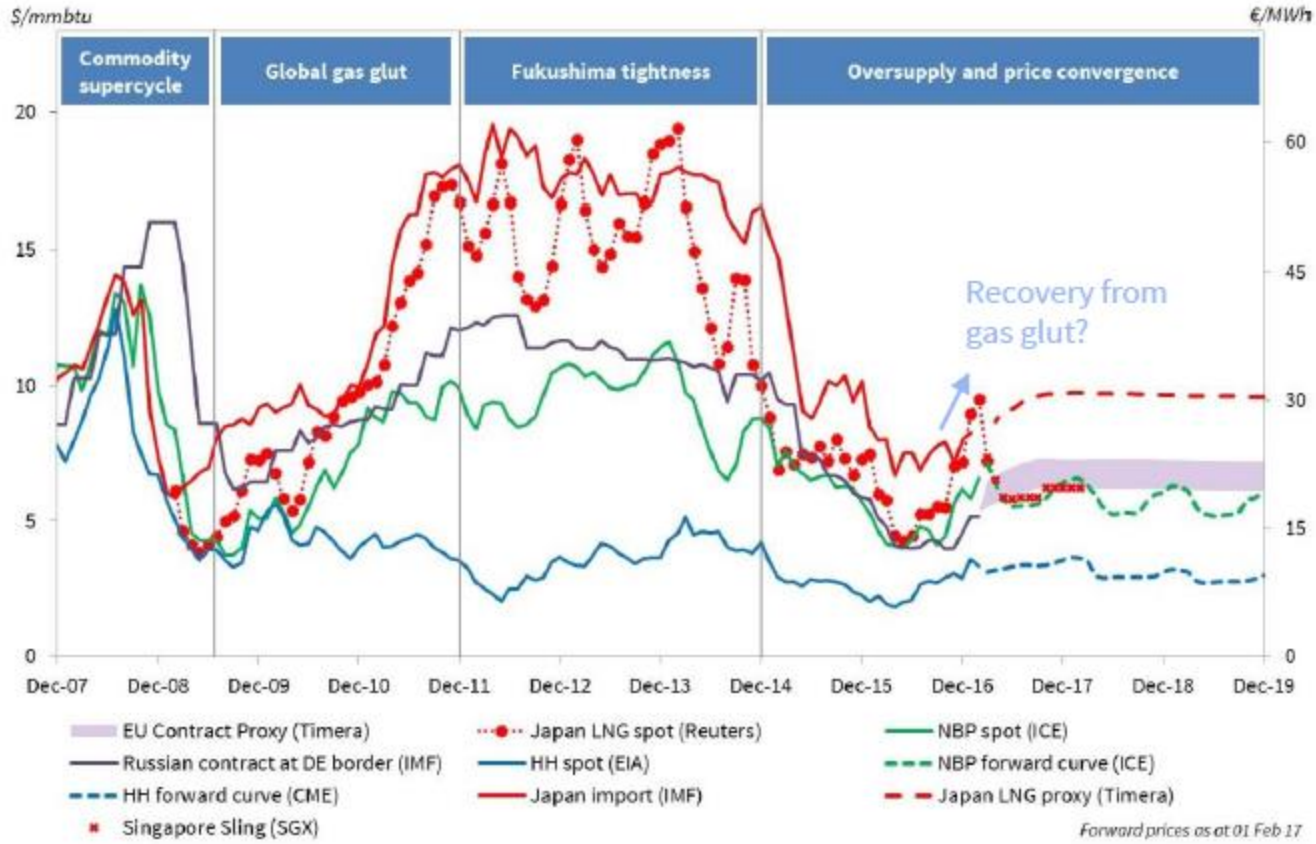
- Recipients want to diversify their supply in order to increase energy security. Reliance on only one "pipeline" provider increases the political risk for the recipient (see: Russian-Ukrainian conflict).
- LNG allows for a significant diversification of supplies (although not every LNG cargo is identical and not every vessel is "fit").
- Deliveries become more regular and uninterrupted.
- Technological development - both production and transport, is becoming more efficient and secure.
- The cost of projects is decreasing - thanks to the development of technology and the scale effect.
- There are bottlenecks at all stages of the LNG production and supply chain (liquefaction, ships, regasification).
- It is easier to raise financing for new projects as well as for the development of existing ones.
- Market development is taking place - more players are causing more predictability and relative price stability.
- Increasing liquidity in the market results in greater interest in financial institutions - resulting in new financial instruments and even greater interest.
- Thanks to the deregulation of markets and the widespread use of tenders, the rules of the game become more transparent.

Rozpływ gazu ziemnego po zastąpieniu gazociągu Braterstwo i Jamalskiego (źródło: Konoplyanik A., In search for new equilibrium (economic rationale for development of new infrastructure for Russian gas supplies to the EU within evolving internal EU gas market & its neighbourhood), Materiały konferencyjne, Kongres SOGA, Bratislava, 26-27.04.2016 r.)

European natural gas flow: fight for price and market share



Źródło: Timera Energy

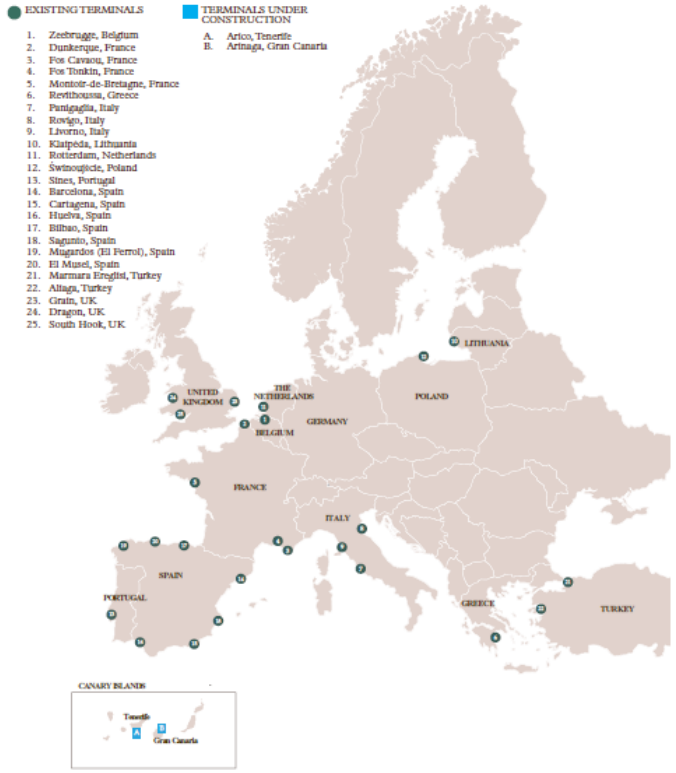


Evolution of global gas price benchmarks

Source: Timera Energy

Źródło: Timera Energy

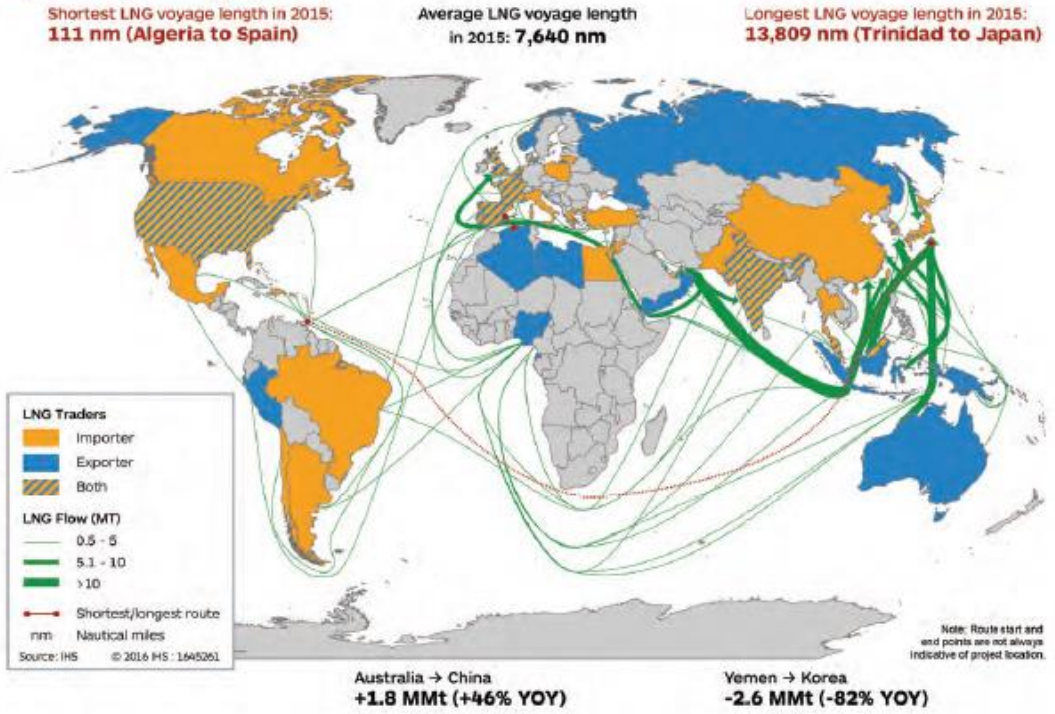
LNG Import Terminals in Europe



The following pages describe the large-scale LNG import terminals that are either currently operating or under construction in Belgium, France, Greece, Italy, Lithuania, the Netherlands, Poland, Portugal, Spain, Turkey and the United Kingdom.

King & Spalding 10

Figure 5.7: Major LNG Shipping Routes, 2015

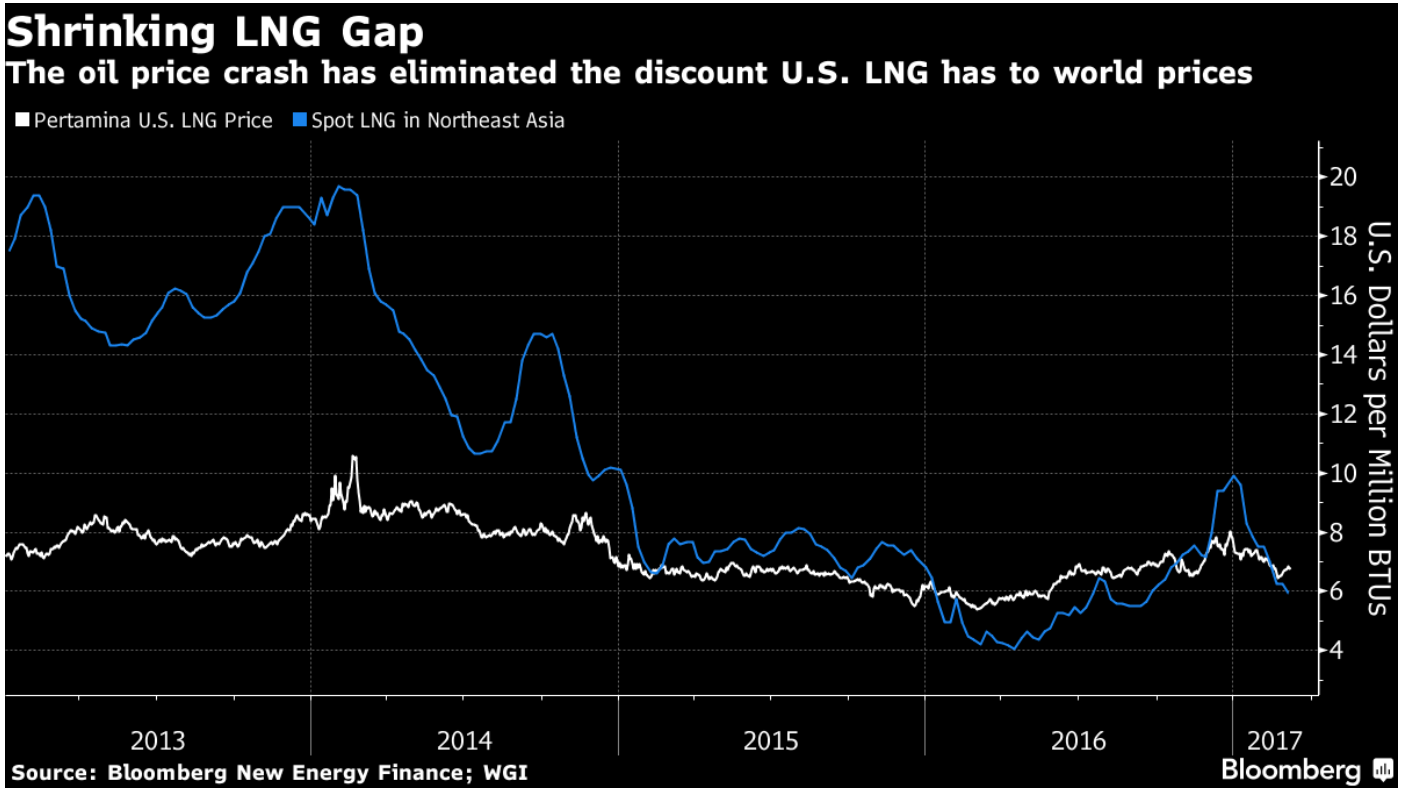


Source: IHS.

Fri, Mar 03 2017. 12 06 PM IST
Gail signs 1st time-swap deal for US LNG with Gunvor

Gail signs a time-swap deal with Swiss trader Gunvor to sell some of its US LNG, as the firm tries to ease the burden of its costly foreign LNG supplies

LNG swaps

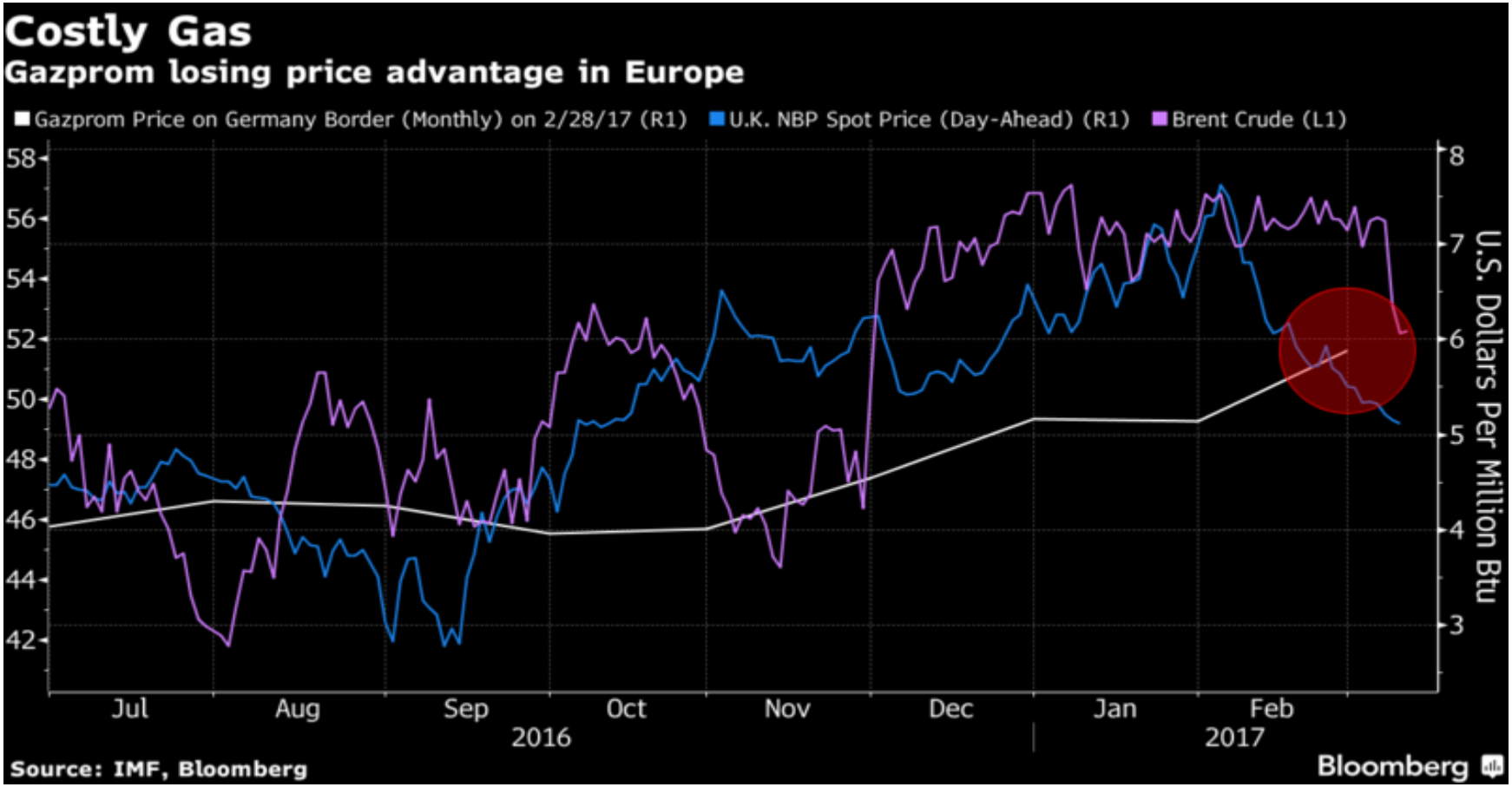


GAIL, India's state gas utility, is seeking agreements with Denmark's Dong Energy and PetroChina Co. to swap about 1 million tons a year of U.S. LNG for delivered supplies to cut shipping costs and time, according to people with knowledge of the plans. The company has a separate deal with Swiss trader Gunvor Group in which GAIL will receive LNG this year in exchange for U.S. cargoes next year.

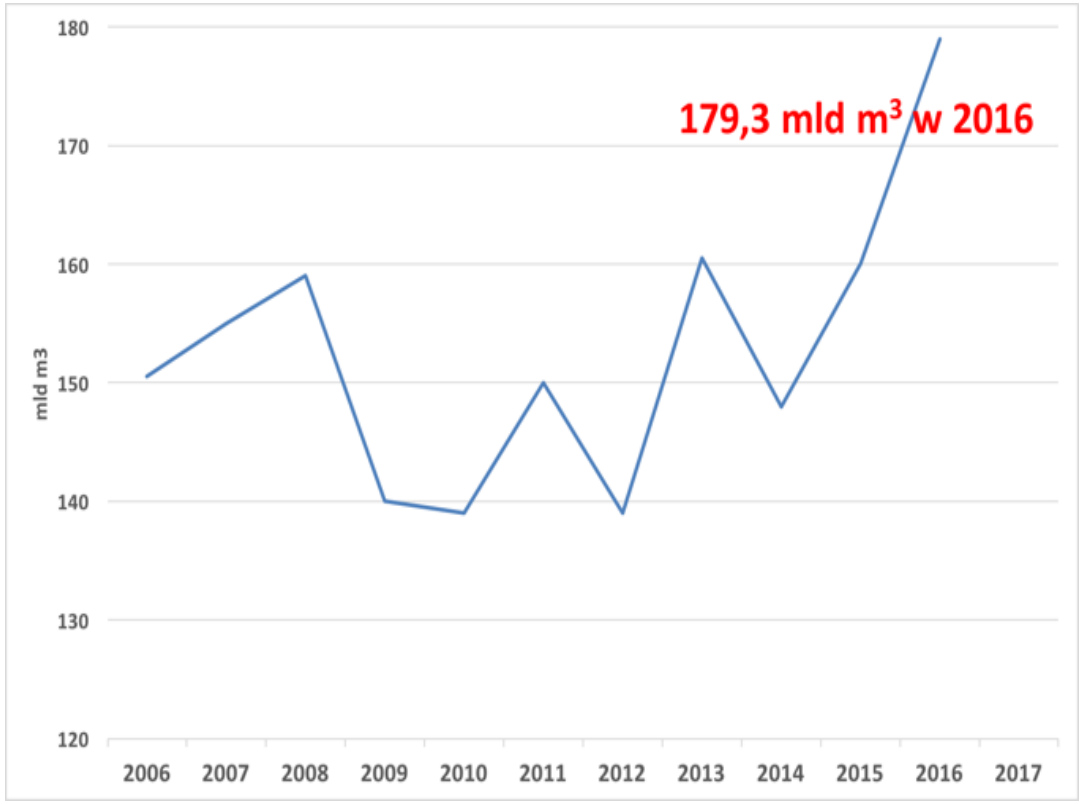
- ***Pertamina in LNG swap talks with international energy firm***
- ***GAIL said to be talking with Dong and PetroChina on swap deal***

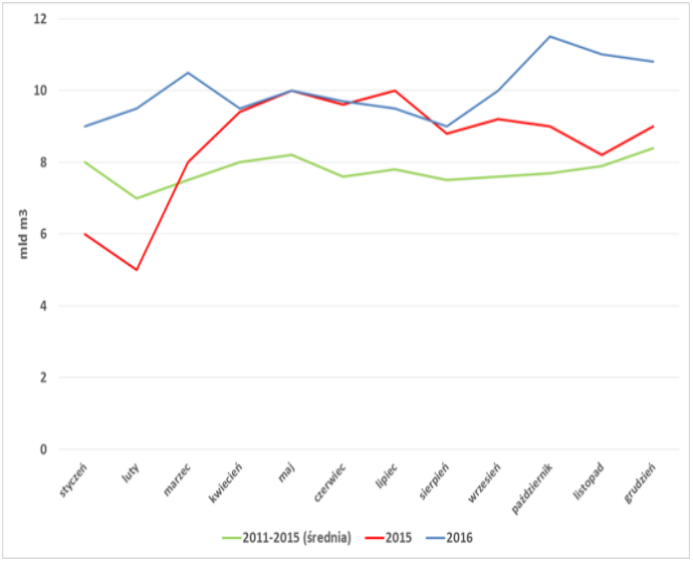
More Asian LNG buyers are trying to avoid taking the U.S. supplies they signed up for just a few years ago in order to cut shipping costs.
GAIL India Ltd. and Indonesia's PT Pertamina are both seeking to trade liquefied natural gas cargoes they are contracted to buy from the U.S. in exchange for supplies shipped from projects closer to home.
They're following buyers such as Tokyo Gas Co. in trying to avoid deliveries of LNG from the U.S. after the global oil price crash reduced the discount of American gas relative to other suppliers. That's made minimizing shipping distances more vital to buyers looking to reduce freight costs.

Natural Gas Price



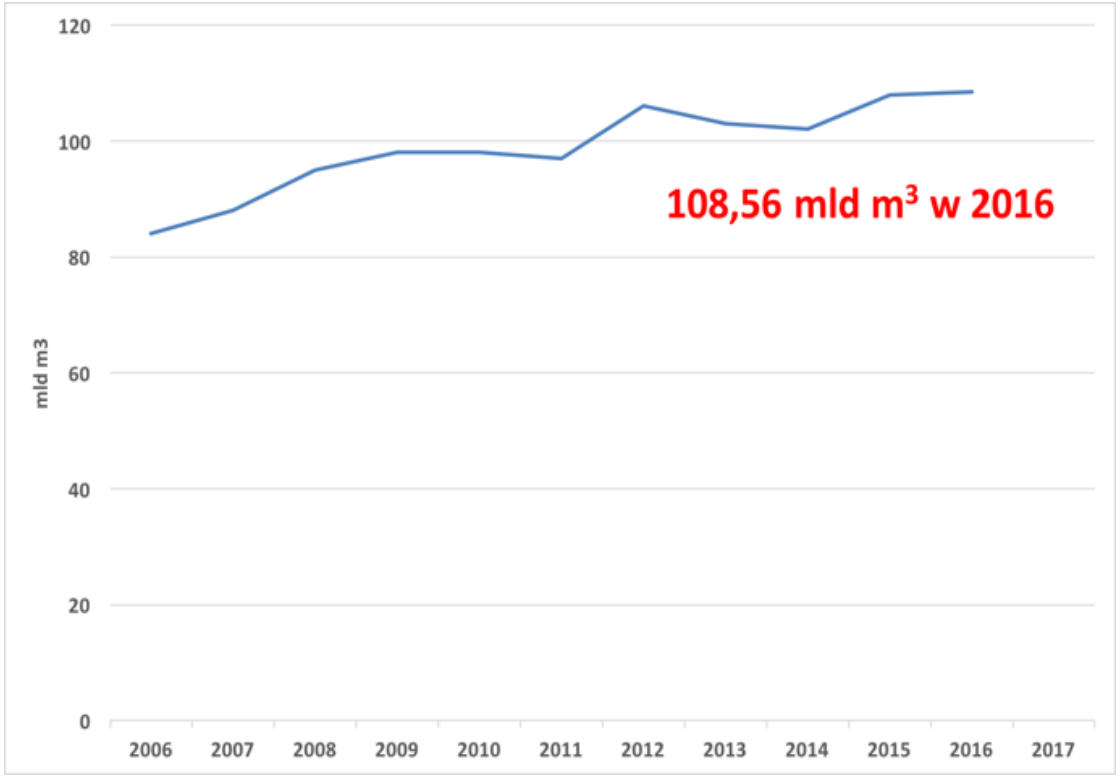
Export of Russian natural gas to Europe + Turkey

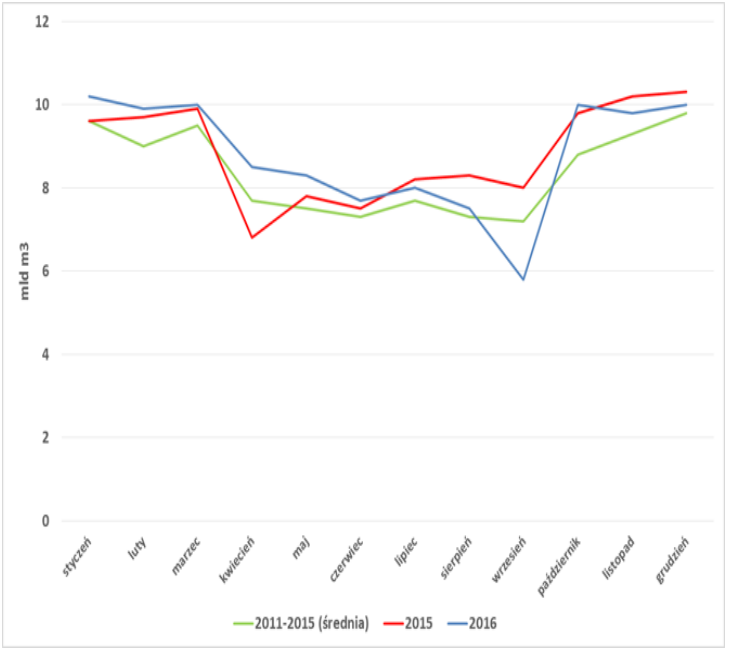




Źródło: Eksport rosyjskiego gazu ziemnego do Europy i Turcji – dane roczne,
Opracowanie: Instytut Studiów Energetycznych; Źródło: Platts, Gazprom Export

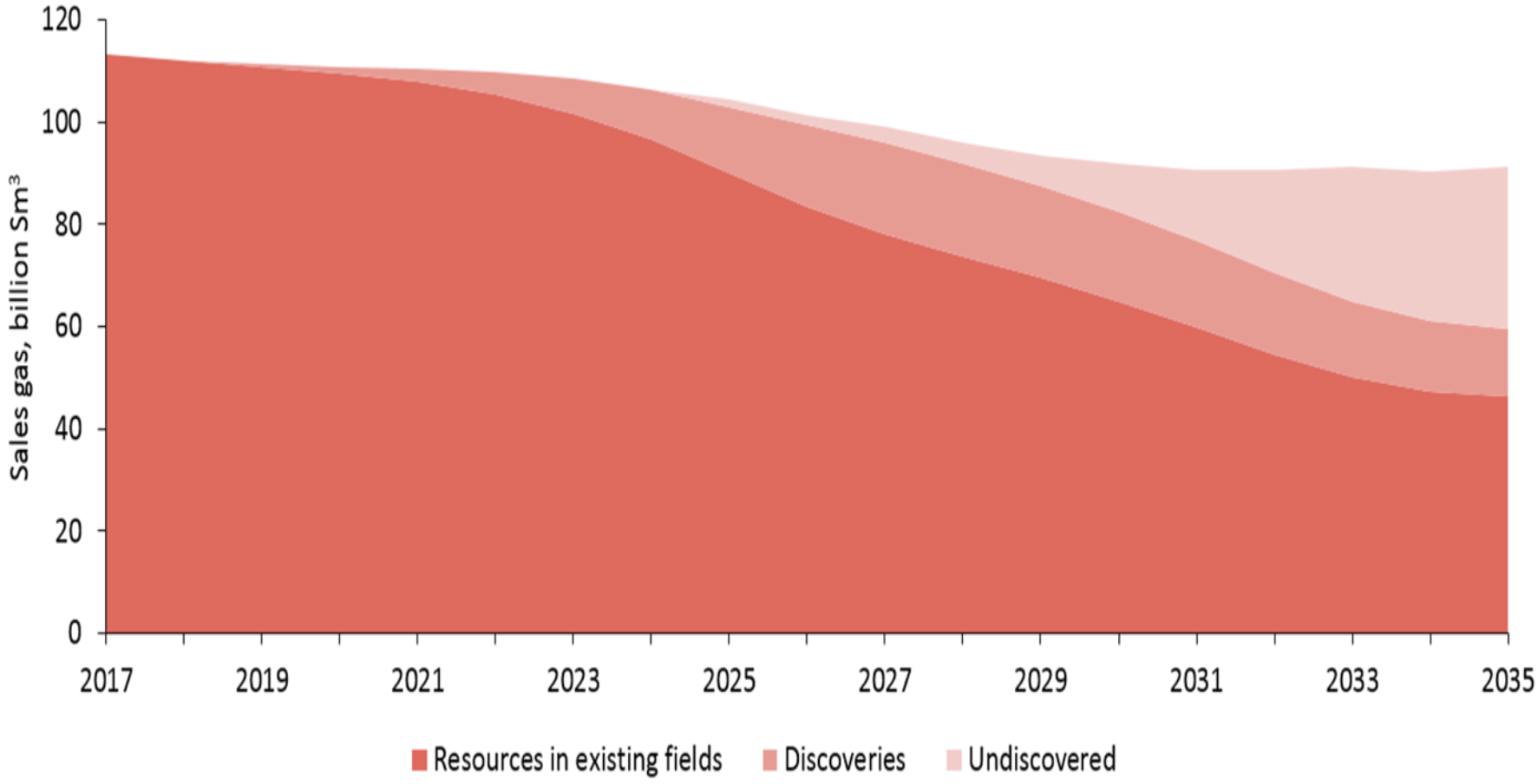
Export of Norwegian atural gas to Europe





Źródło: Eksport norweskiego gazu ziemnego do Europy – dane roczne, Opracowanie: Instytut Studiów Energetycznych; Źródło: Platts, Gasco

Forecasted sales volume of gas from Norwegian fields, 2017-2035



Źródło: The Norwegian Petroleum Directorate, styczeń 2017

Forecasted sales volume of gas from Norwegian fields, 2017-2035

Asset Backed Trading – some examples

Time

- Gas production optimization
- Contango play liquids
- Storage facilities

Geography

- Market optimization
- Trading
- Transport optimization

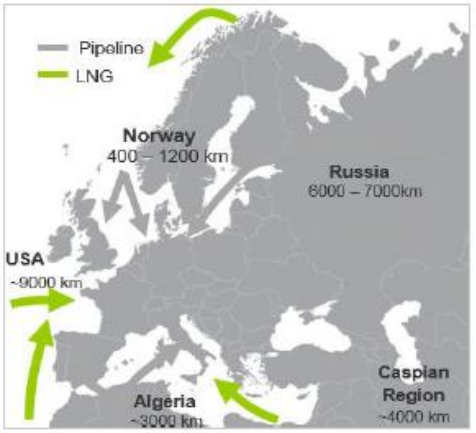
Quality

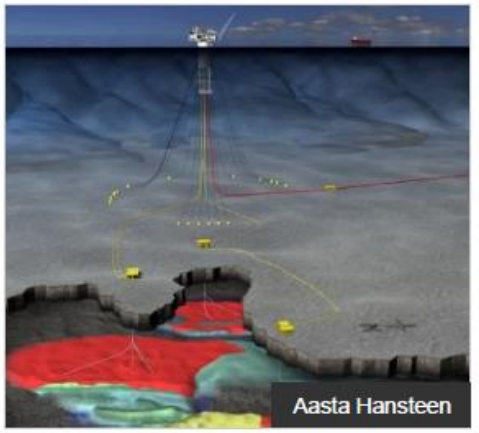
- Swap piped gas to LNG
- Quality swaps liquids
- Blending

Źródło: The Norwegian Petroleum Directorate, styczeń 2017

Prognozowane wolumeny sprzedaży gazu z norweskich złóż, 2017-2035

Norwegian gas – securing energy supply in Europe





Affordability for customers

- Flexibility
- Liquidity
- Effective infrastructure

Proximity to markets

- Piped gas and LNG
- Delivery within hours
- Competitiveness

Long-term commitment

- Resource potential
- Security of supply
- Scalable for low carbon

Źródło: The Norwegian Petroleum Directorate, styczeń 2017 ;http://www.norskpetroleum.no/en/production-and-exports/exports-of-oil-and-gas/
http://www.platts.com/latest-news/natural-gas/london/dutch-court-to-hold-full-groningen-natural-gas-26671072

LPG conclusions

- Propane consumption in the world is rapidly growing: over the last five years its consumption has increased by some 20 million tons (to more than 145 million tons per year); A similar change in consumption is expected over the next five years.
- It is interesting to look at the supply and demand from the point of view of "propane geography". Europe is unique enough (treated as a whole, together with the countries of the former Soviet Union). This uniqueness comes from a relatively good "match" of supply and demand - Europe (treated in the above-described borders) is largely balanced and deficits (about 10% of total consumption, now reaching about 20 million tons per annum) are supplemented primarily Supplies from the Algerian market.
- Outside of Europe, there are two main areas of propane supply and three areas of consumption - these areas only partially overlap, generating large commercial flows: propane transported primarily by sea. These areas of production are the United States and countries around the Gulf, and consumption is concentrated in the United States, the Far East and the Gulf, with North America, despite huge consumption, generates very large surpluses (the same but to a lesser extent Gulf of Persia). The Far East, despite its large production, generates a huge additional demand for imported propane. As a result, propane trading can be described as a fairly simple mechanism: the US export stream is replenished by the Gulf of Surplus, and continues to China and Japan (and to a lesser extent India and South Korea). Surplus propane from Africa and South East Asia. They flow in the same direction.

LNG conclusions

- End of PGNiG contract - Gazprom Export for gas supplies in 2022,
- The end of the gas transit contract by the Yamal gas pipeline in 2019, and in consequence, in the wrong scenario, the possibility for the Russians to indicate any place for receiving gas for 2020-22,
- No purchase of the first methane from the US to show Russia that US LNG is also our possible direction,
- High costs of extracting natural gas from the bottom of the North Sea and the Barents Sea,
- The quality of the gas from Norway, ie the high level of its sulfur,
- An economically attractive solution based on the existing opportunities for congestion of Norwegian natural gas using existing infrastructure and sending it to Poland (using interconnectors in Denmark and Germany);
- The new long-term contract, this time with Norway, will be the basis for repayment of the Northern Gate project, unless PGNiG is going to acquire concessions and capacity in Norway of 7-10 billion cubic meters annually.

Źródło: The Norwegian Petroleum Directorate, styczeń 2017 ;http://www.norskpetroleum.no/en/production-and-exports/exports-of-oil-and-gas/ http://www.platts.com/latest-news/natural-gas/london/dutch-court-to-hold-full-groningen-natural-gas-26671072

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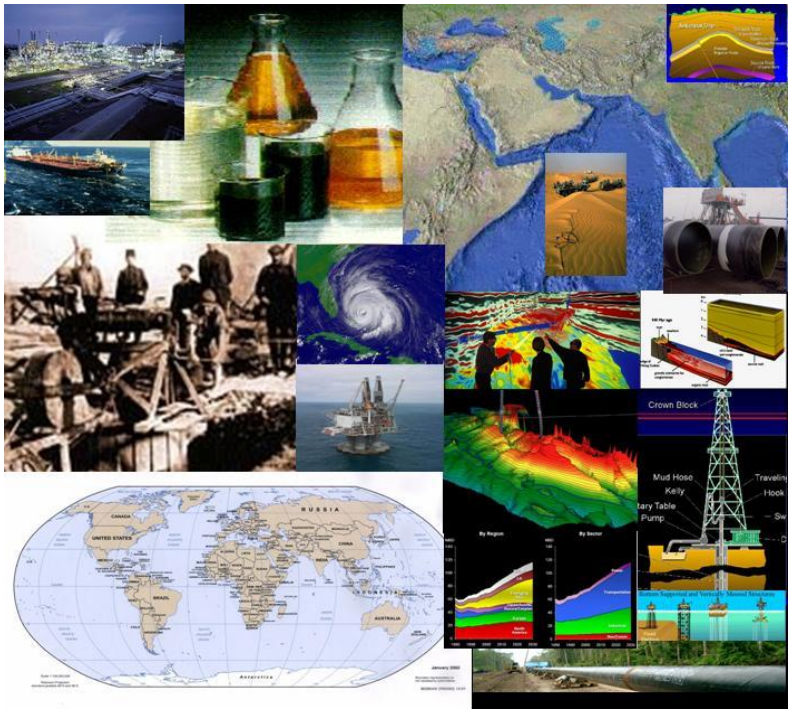

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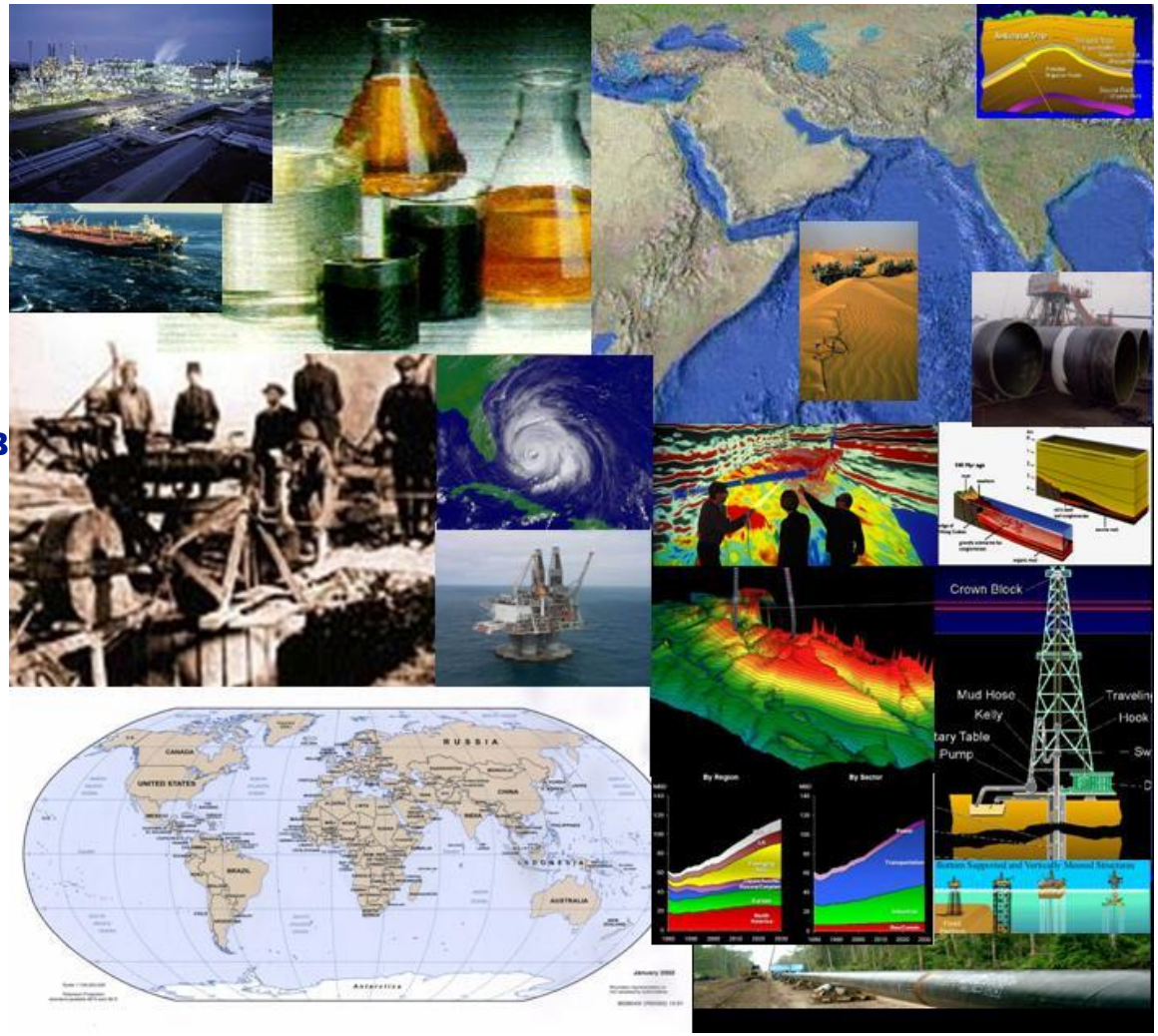

Rafineries closed

Zamknięte					
Kraj	Firma	Lokalizacja	Forma likwidacji	Moce przerobowe mln ton/rok	Rok zamknięcia
Francja	Total SA	Mardyck	Zamiana na terminal logistyczny	6,94	2009
W.Brytania	Petroplus	Teesside	Zamiana na terminal logistyczny	5,77	2009
Francja	Total SA	Gonfreville L'Orcher	Częściowo zamknięta	4,49	2010
Niemcy	Phillips 66 (CoP)	Wilhelmshaven	Zamiana na terminal logistyczny	12,82	2010
Słowenia	Lendava Refinery	Lendava	Nieczynna (bez przerobu)	0,67	2010
Włochy	Tamoil Italia SpA	Cremona	Zamiana na terminal logistyczny	4,69	2011
Francja	Petroplus	Reichstett-Vendenheim	Zamiana na terminal logistyczny	4,18	2011
Rumunia	Rafo SA	Onesti	Nieczynna (bez przerobu)	3,45	2011
Czechy	Paramo	Pardubice	Częściowo zamknięta	0,99	2012
Rumunia	OMV Petrom	Pitesti	Nieczynna (bez przerobu)	3,45	2012
Włochy	TotalErg	Rzym	Zamiana na terminal logistyczny	4,24	2012
Niemcy	Nynas	Harburg-Grasbrook	Częściowo zamknięta	2,47	2012
Francja	Lyondell Basell	Berre l'Etang	Nieczynna (bez przerobu)	5,18	2012
Francja	Petroplus	Petit Couronne	Zamiana na terminal logistyczny	8,09	2012
W.Brytania	Petroplus	Coryton Essex	Zamiana na terminal logistyczny	8,48	2012
Włochy	Agip Petroli	Porto Marghera	Zamiana na biorafinerię	3,95	2013
Rumunia	Astra SA	Ploiesti	Nieczynna (bez przerobu)	2,76	2013
Hiszpania	CEPSA	Tenerife	Nieczynna (bez przerobu)	4,59	2013
Włochy	MOL	Frassino, Mantova	Zamiana na terminal logistyczny	3,42	2013
Serbia	Naftna Industrije Serbia	Novi Sad	Nieczynna (bez przerobu)	5,76	2013
Włochy	Agip Petroli	Gela	Zamiana na biorafinerię	5,18	2014
W.Brytania	Murphy	Milford Haven	Zamiana na terminal logistyczny	6,41	2014
W.Brytania	Essar Group	Stanlow	Częściowo zamknięta	4,98	2014
RAZEM			Wyłączone z przerobu	112,96	

Planowane do sprzedaży/zamknięcia					
Kraj	Firma	Lokalizacja	Forma likwidacji	Moce przerobowe mln ton/rok	Rok zamknięcia
Dania	AS Dansk Shell	Fredericia	Na sprzedaż	3,45	N/A
Holandia	Kuwait Petroleum Europoort BV	Rotterdam	Na sprzedaż	4,01	N/A
Włochy	Agip Petroli	Livorno	Planowane zamknięcie	4,14	N/A
Włochy	Agip Petroli	Taranto	Planowane zamknięcie	4,14	N/A

Źródło: Obliczenia własne na podstawie danych IHS Energy, sierpień 2014