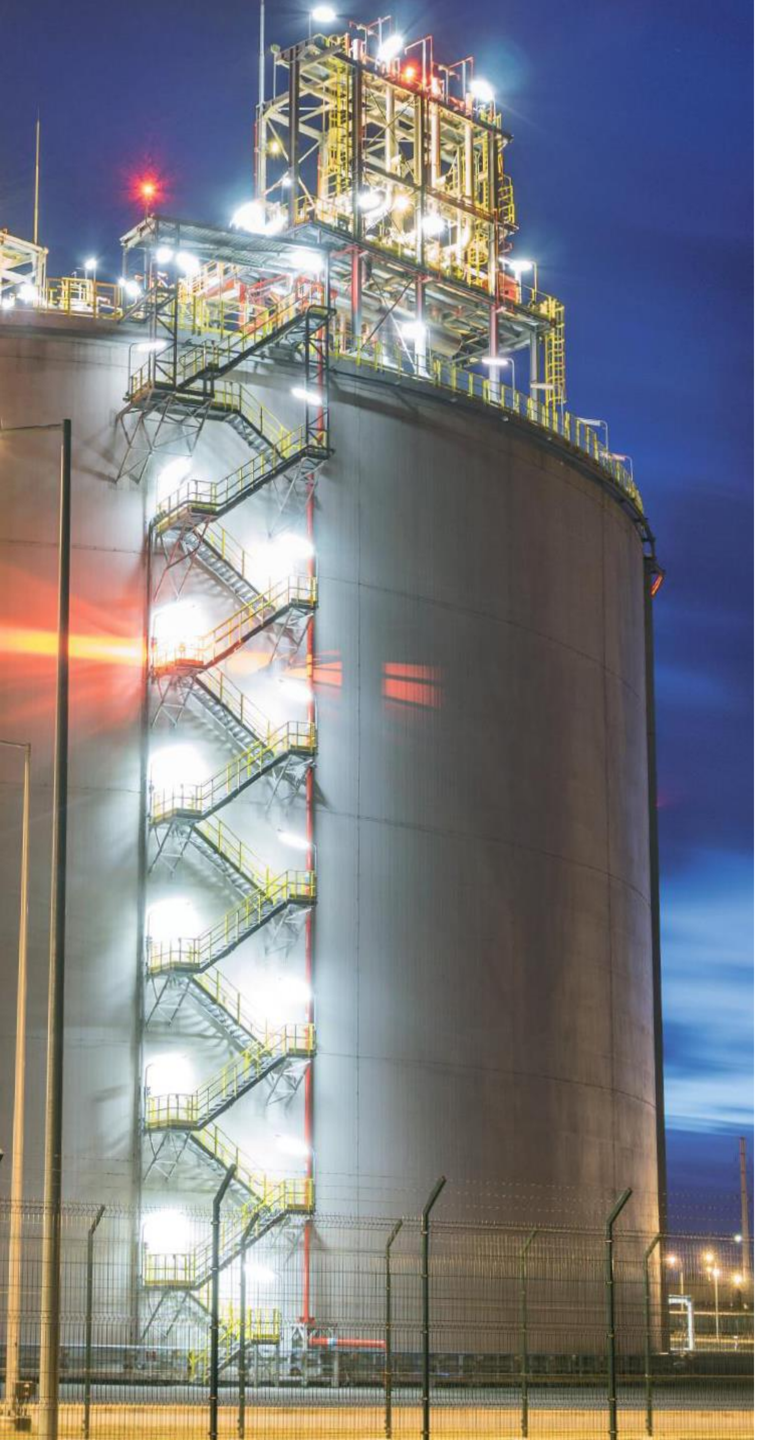


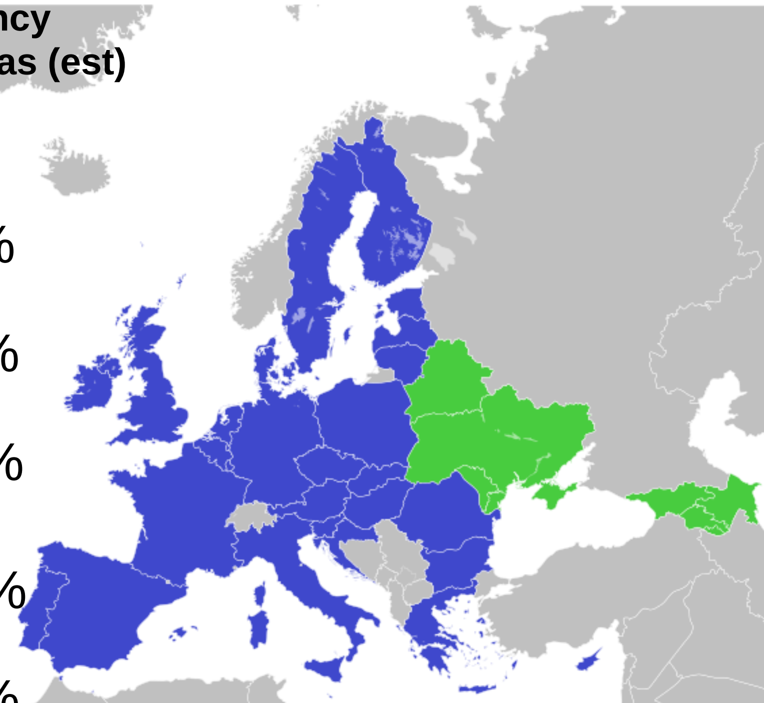
Eastern Partnership
2nd Energy panel
27 November 2018 | Brussels, Belgium

LNG prospects in Ukraine

Laktionov Oleksandr,
Head of strategic projects and programs
Naftogaz of Ukraine

Dependency on Russian gas in Eastern Partnership

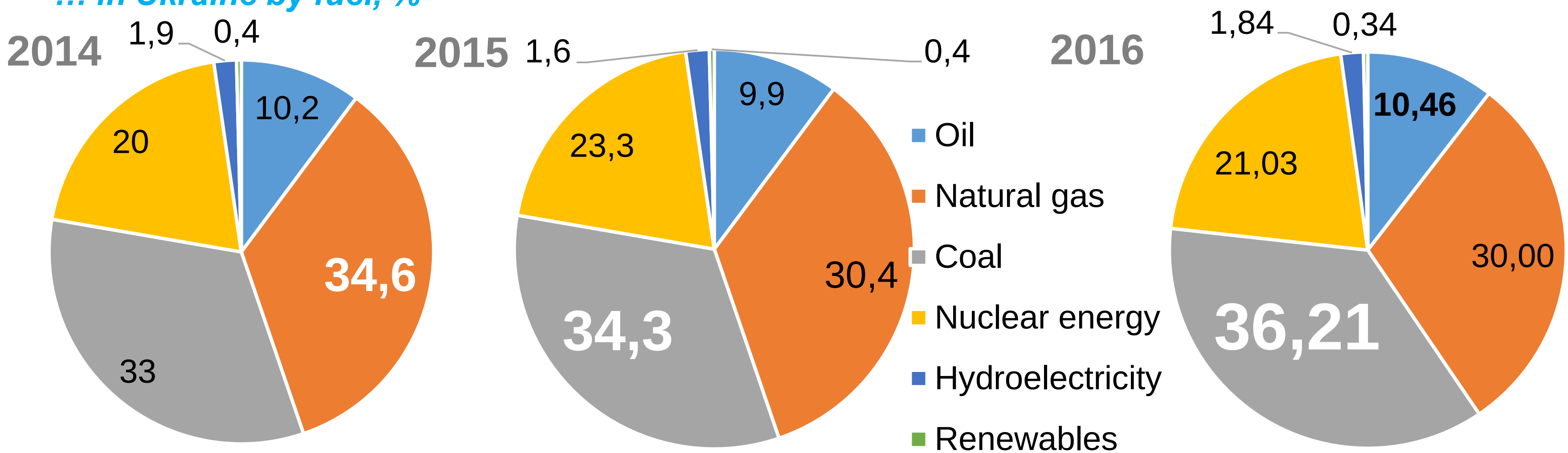
Country member of the Eastern Partnership	Russian gas supply (ave), bcm	Dependency on Russian gas (est)
Ukraine	0	>0%
Georgia	~0,2	~10%
Azerbaijan	~1,9	~18%
Armenia	~2	~83%
Moldova	~3	>95%
Belarus	~19	100%



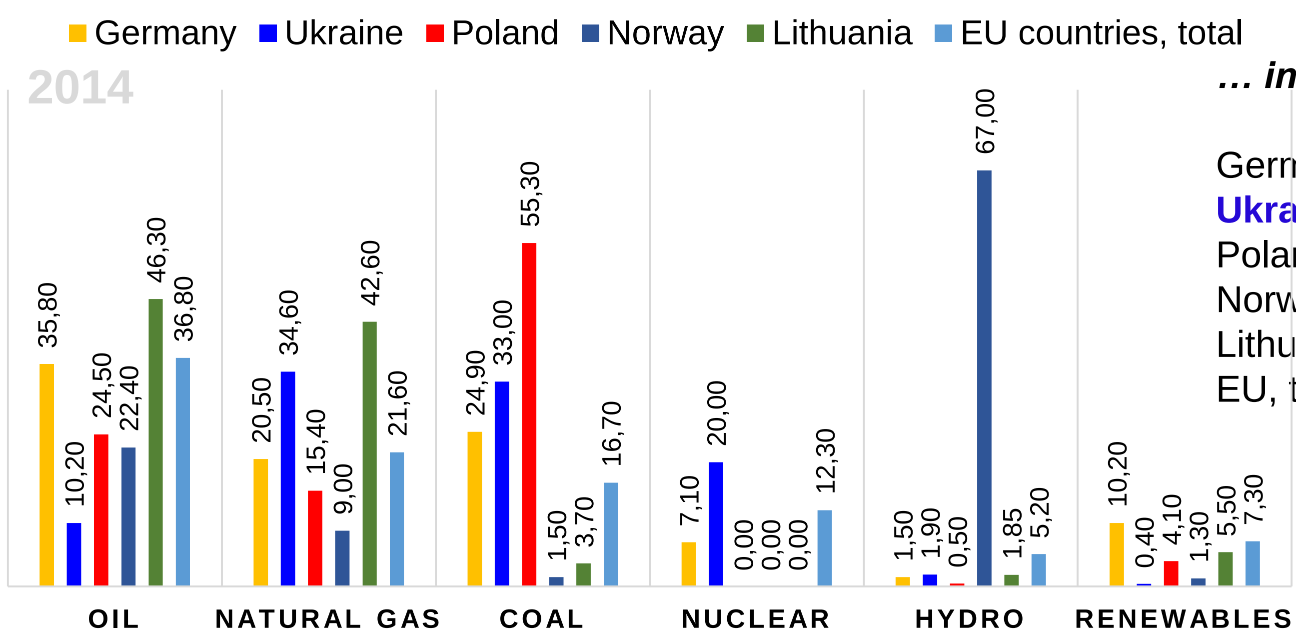
Energy profile of Ukraine

Primary energy consumption in Ukraine

- *… in Ukraine by fuel, %*



- *… in some countries by fuel, %*



***… in total by countries,* mln.toe:**

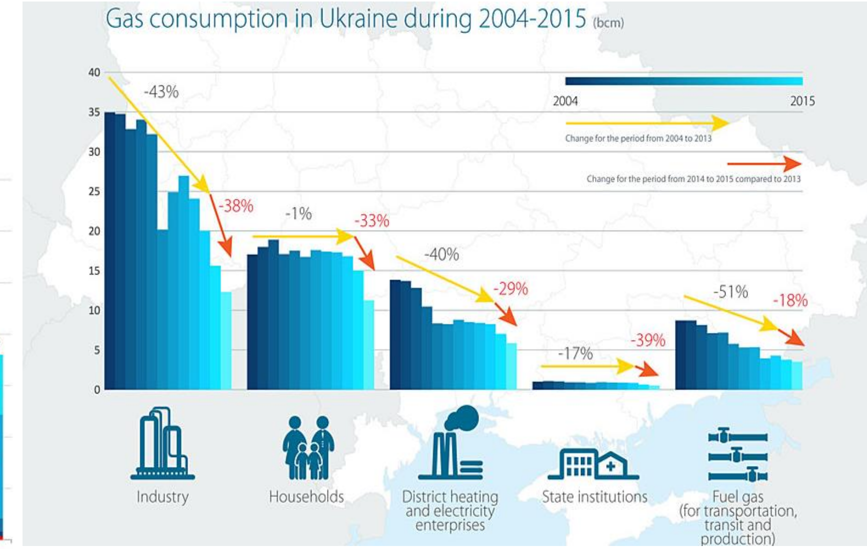
	2014	*2015*	*2016*
Germany	- 311	320,6	322,5
Ukraine	**- 100,1**	**85,1**	**87**
Poland	- 95,7	95	96,7
Norway	- 46,7	47,1	48,6
Lithuania	- 5,4	5,3	5,5
EU, total	- 1611,4	1575	1642

Source: BP Statistical review

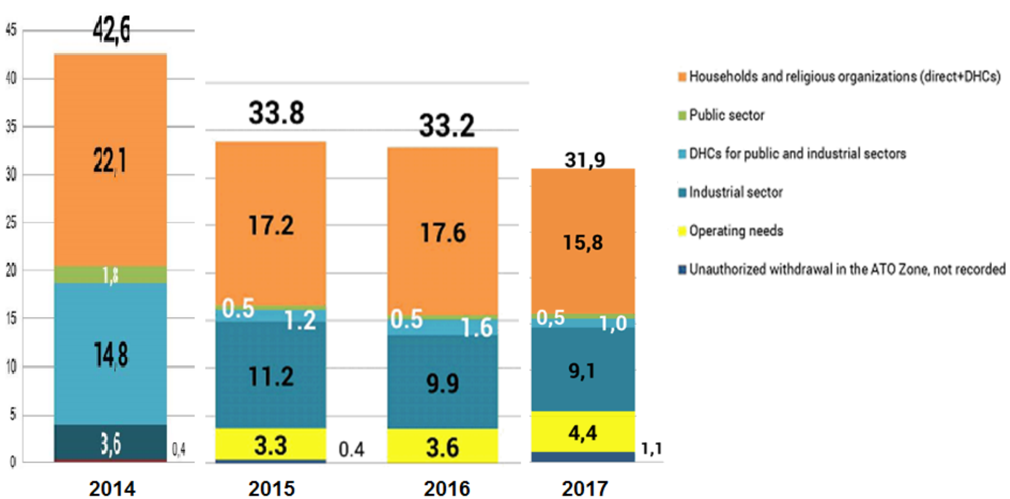
Natural gas – one of the main source of energy for Ukraine's economy

Natural gas consumption ~31,9 bcm in 2017

- *actual volumes in total*



- *main consumers*



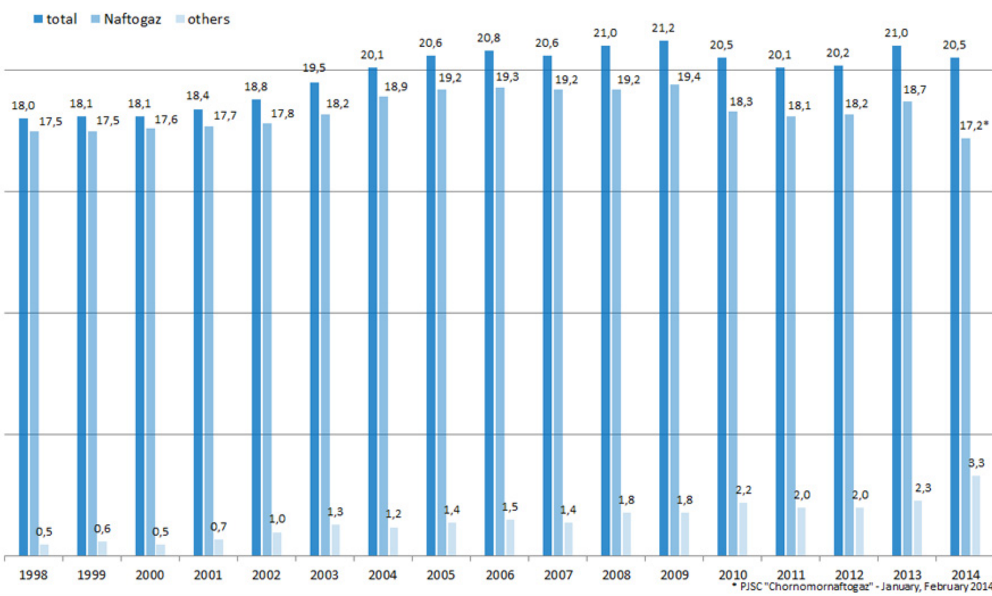
Consumer category	**2015**	**2016**	**2017**	**+/- %**
Households	11.3	11.9	11.2	-6%
DHCs* for households	5.9	5.7	5.6	
Religious organizations (direct + DHCs)	0.017	0.019	0.019	
Regulated segments total:	17.2	17.6	16,8	-5%
Public sector	0.5	0.5	0.5	0%
DHCs for public and industrial sectors	1.2	1.6	0	
Industrial sector	11.2	9.9	9.1	-6%
Operating needs (gas production, transmission and distribution)	3.3	3.6	4,4	+16%
Unregulated segments total:	16.2	15.6	14.0	-10%
Unauthorized withdrawal in the ATO zone, unrecorded volumes and imbalance	0.4	0.01	1.1	
Total	33.8	33.2	31.9	-4%

** District Heating*

Natural gas consumption in Ukraine is decreasing

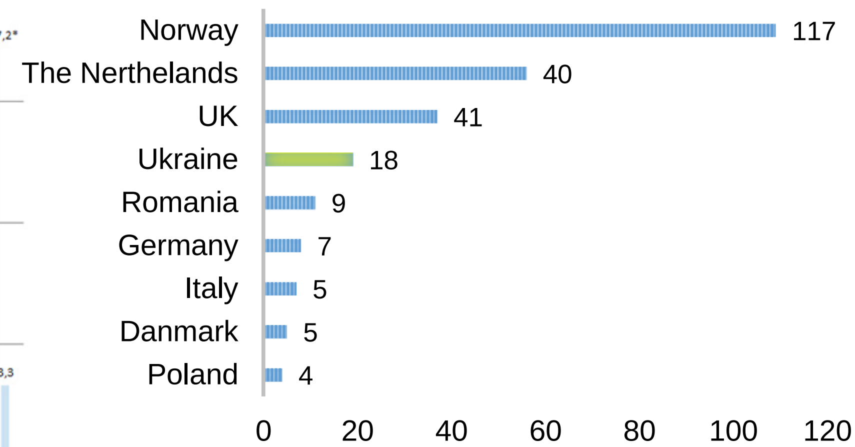
Natural gas production – 20,8 bcm in 2017

- ## *Gas production, bcm*

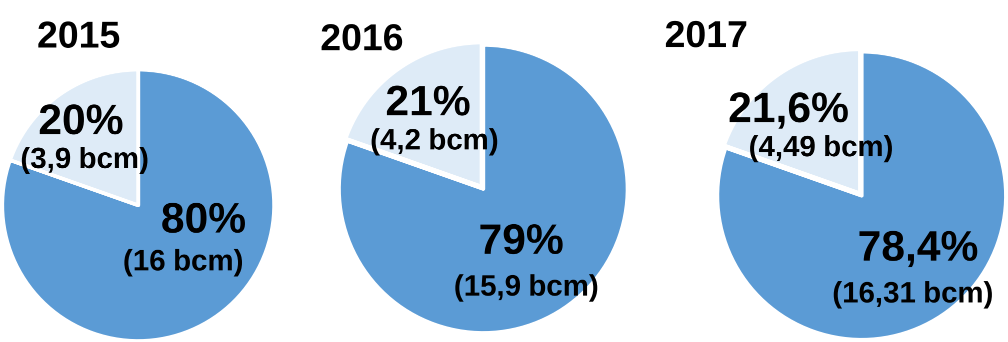


Source: http://naftogaz-europe.com

THE BIGGEST GAS PRODUCTION COUNTRIES IN EUROPE IN 2016, BCM

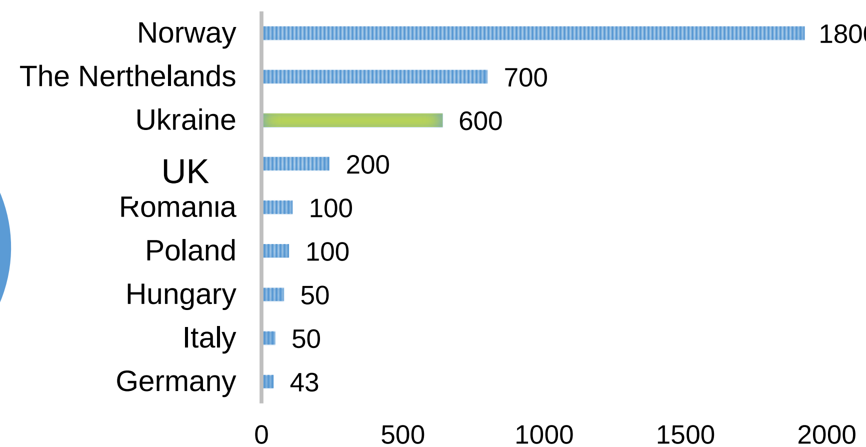


- ## *Main local gas producers*



■ Naftogaz of Ukraine (incl. Ukrgazvydobubannya, Ukrnafta, excl. Chornomornaftogaz on occupied territory in Crimea)

THE BIGGEST GAS PROVED RESERVES BY COUNTRIES IN EUROPE, BCM

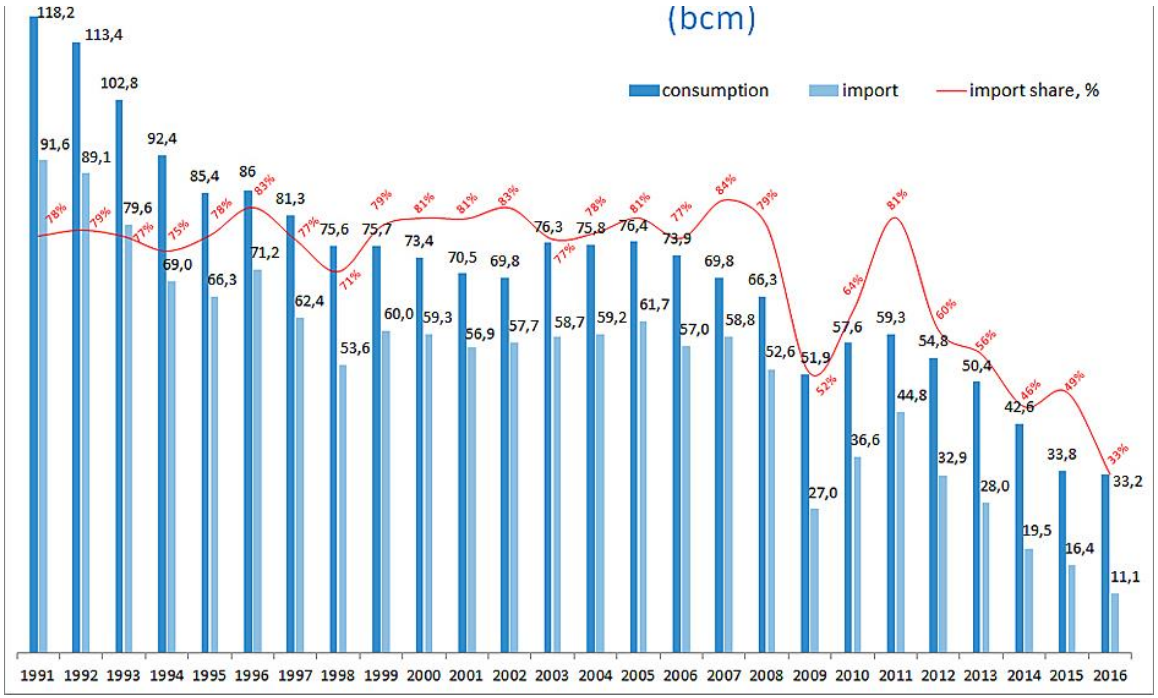


Source: BP Statistical review, June 2017

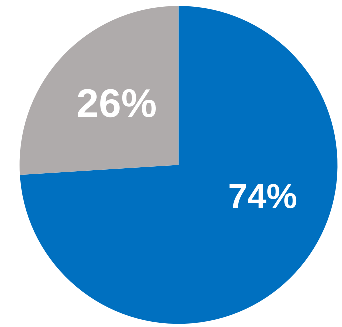
Main operator – NAFTOGAZ GROUP

New goal: 27,8 bcm to 2020

Gas import by sources – 14,1 bcm in 2017



Gas import structure in 2016,%

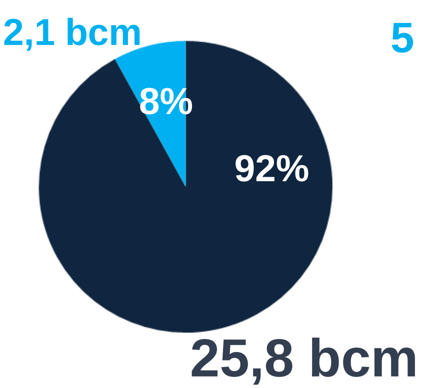


- **Above 20 importers**

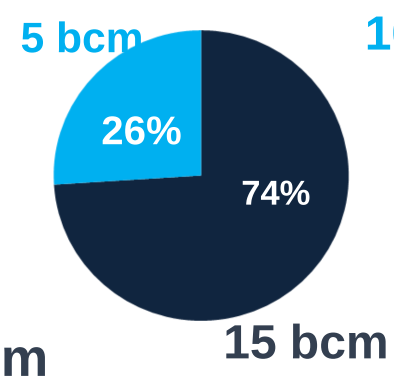
Main importer - NAFTOGAZ GROUP

In 2017 up to 30 importers

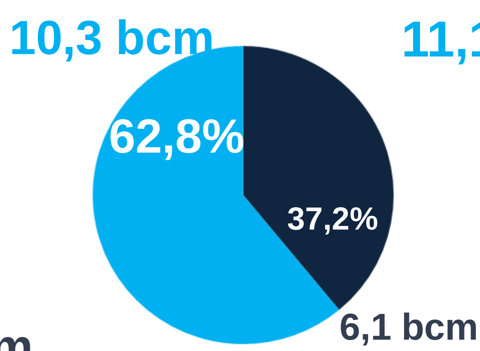
2013 – *27,9 bcm*



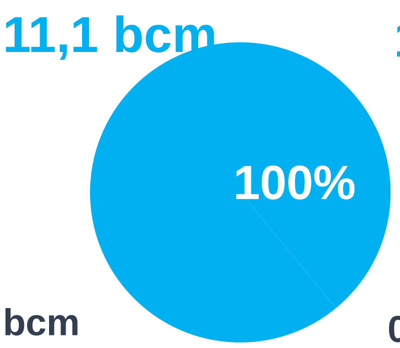
2014 – *20 bcm*



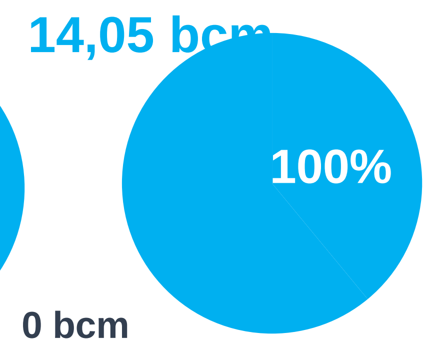
2015 – *16,4 bcm*



2016 – *11,1 bcm*



2017 – *14,05 bcm*



Russia, single supplier **Europe, multiple suppliers**

Natural gas import by directions (diversification)

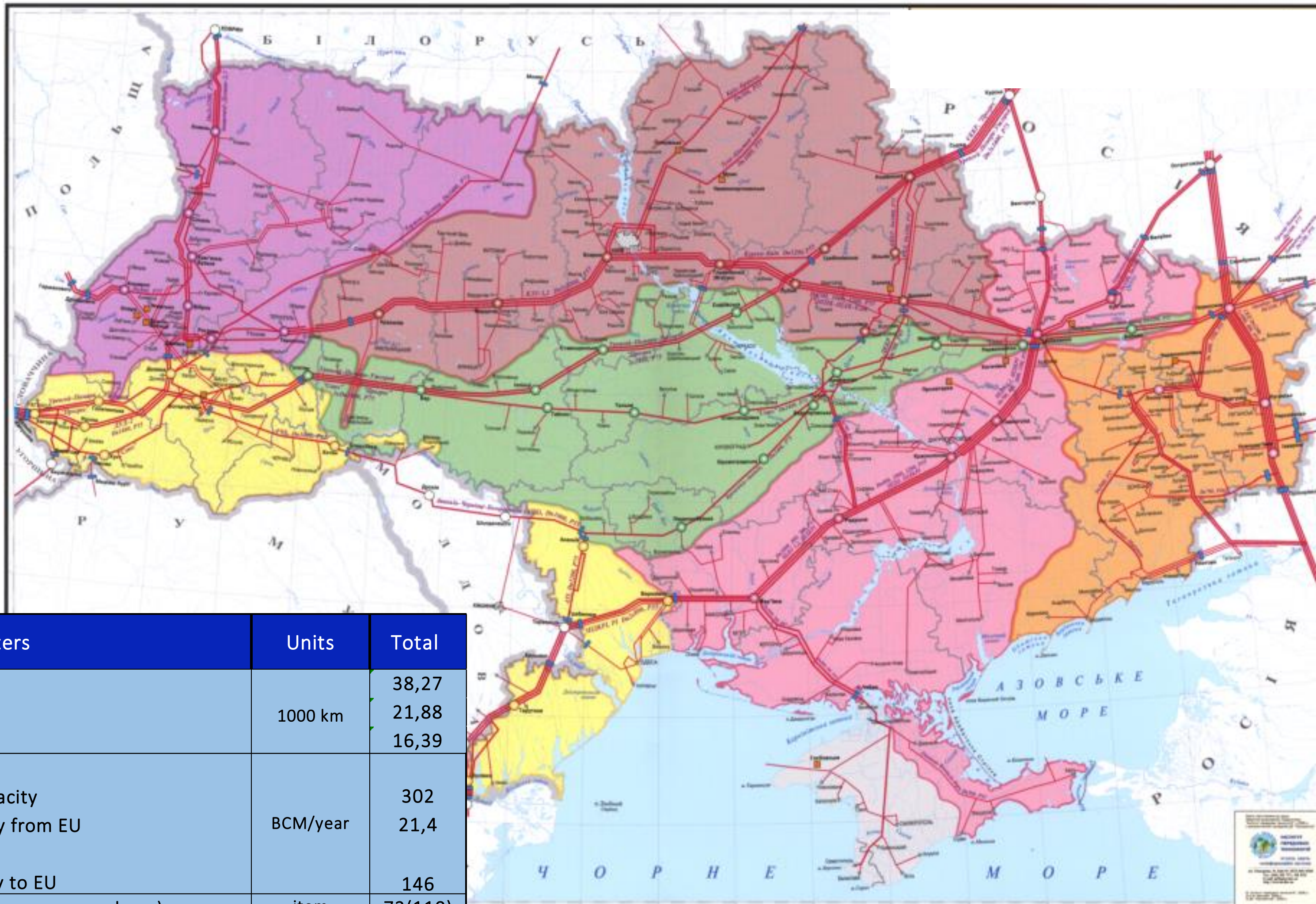
Import directions	2013	2014	2015	2016	2017
Import, total:	28	19,5	16,4	11,1	14,05
from Russia	25,8	14,5	6,1	0	0
from EU, total	2,1	5,0	10,3	11,1 (8,17*)	14,05
via Poland (GMS Hermanowice)	*0,99*	*0,9*	*0,1*	*1,0 (0,01*)*	*1,305*
via Hungary (GMS Beregdaroc)	*1,1*	*0,6*	*0,5*	*1,0 (0,02*)*	*2,835*
via Slovakia (GMS Budince)	*0*	*3,6*	*9,7*	*9,1 (8,14*)*	*9,91*

**Note: Naftogaz's volumes*

Russia

Gas transmission system of Ukraine

- ***Main parameters***

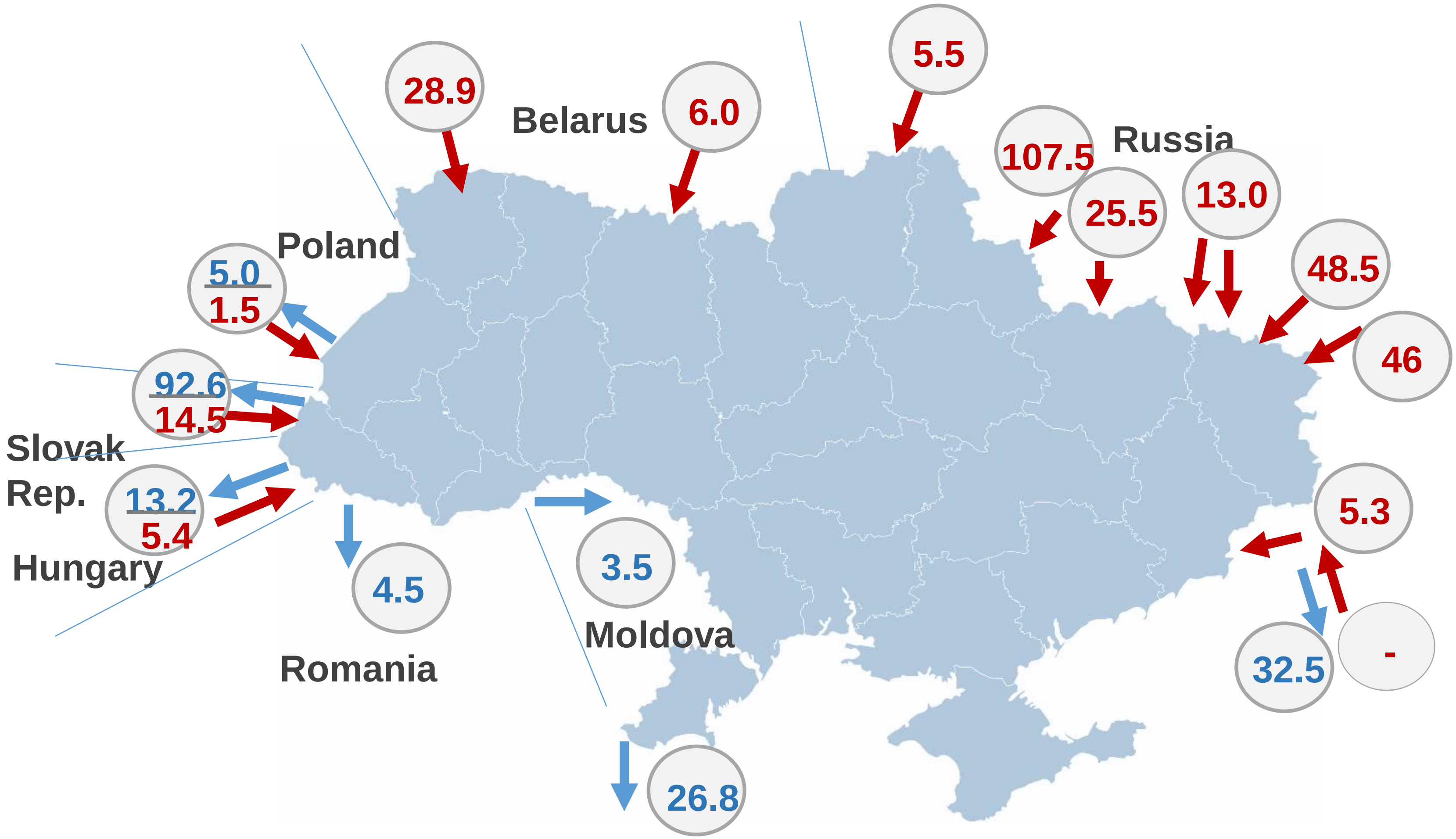


Parameters	Units	Total
Length of gas pipelines, total including: - gas mains - pipeline branches	1000 km	38,27 21,88 16,39
Throughput capacity of GTS: entry capacity entry cappacity from EU exit capacity to EU	BCM/year	 302 21,4 146
Number of compressor stations (compressor shops)	item	72(110)
Number of gas compressor units	item	702
Capacity of compressor stations	MW	5 448,0
Number of underground gas storage facilities (UGSF)	item	12
Total working volume of UGSF	bcm	30,95
Number of gas distribution stations (GDS)	item	1456

The reliability of Ukrtransgaz’ transportation system has been certified according to quality standard ISO 9001, a leading international benchmark.

Gas transmission system of Ukraine (continue)

- *Entry/exit points and their capacities*



Total «Entry» capacity – 302 bcma, including:

280,6 bcma (on UA border with RF and Belarus);

21.4 bcma (on UA-EU border in UA direction)

Total «Exit» capacity – *146 bcma (in EU direction)*

Legend:

«Entry»

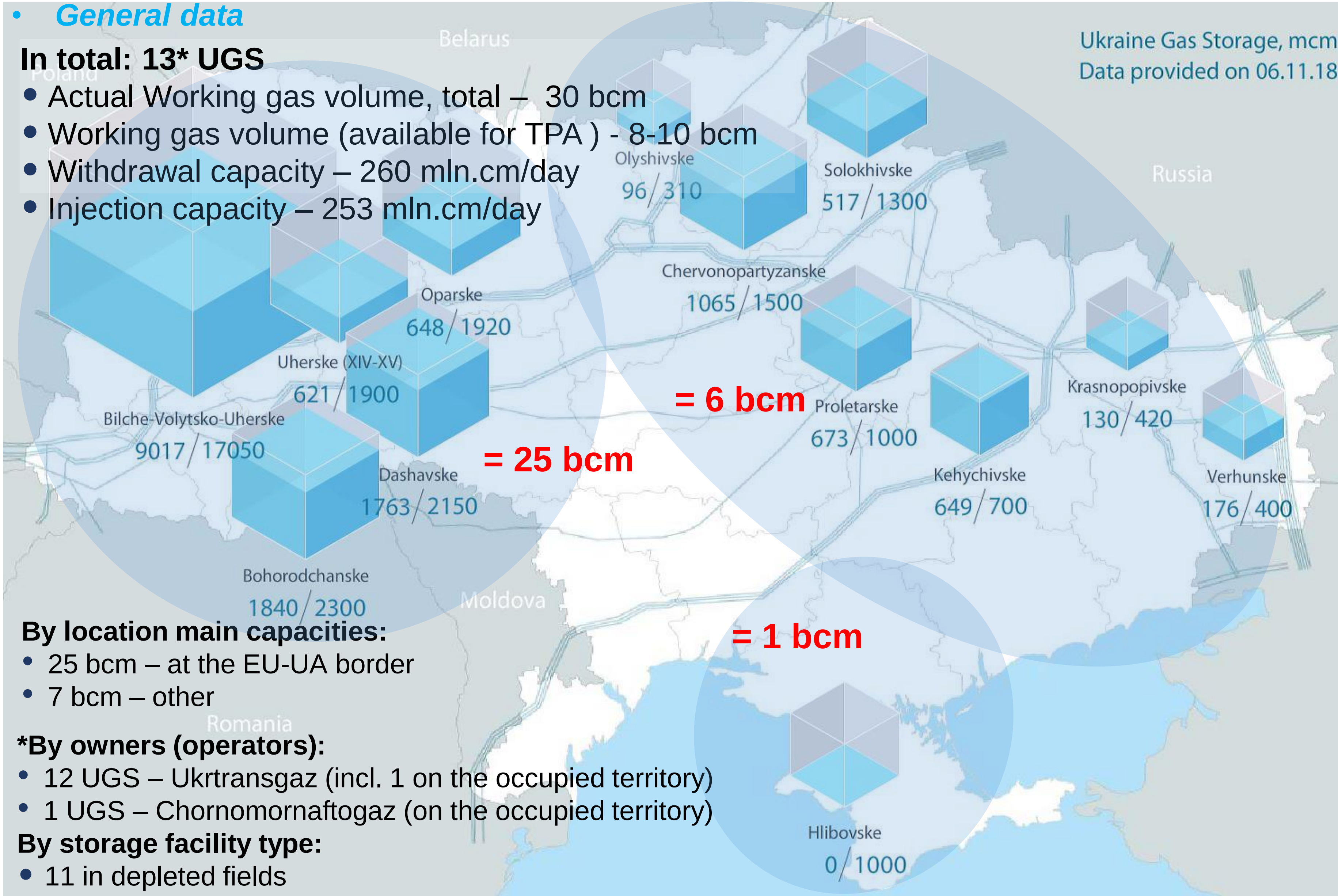
«Exit»

Underground gas storage of Ukraine

- *General data*

In total: 13* UGS

- Actual Working gas volume, total – 30 bcm
- Working gas volume (available for TPA) - 8-10 bcm
- Withdrawal capacity – 260 mln.cm/day
- Injection capacity – 253 mln.cm/day



By location main capacities:

- 25 bcm – at the EU-UA border
- 7 bcm – other

***By owners (operators):**

- 12 UGS – Ukrtransgaz (incl. 1 on the occupied territory)
- 1 UGS – Chornomornaftogaz (on the occupied territory)

By storage facility type:

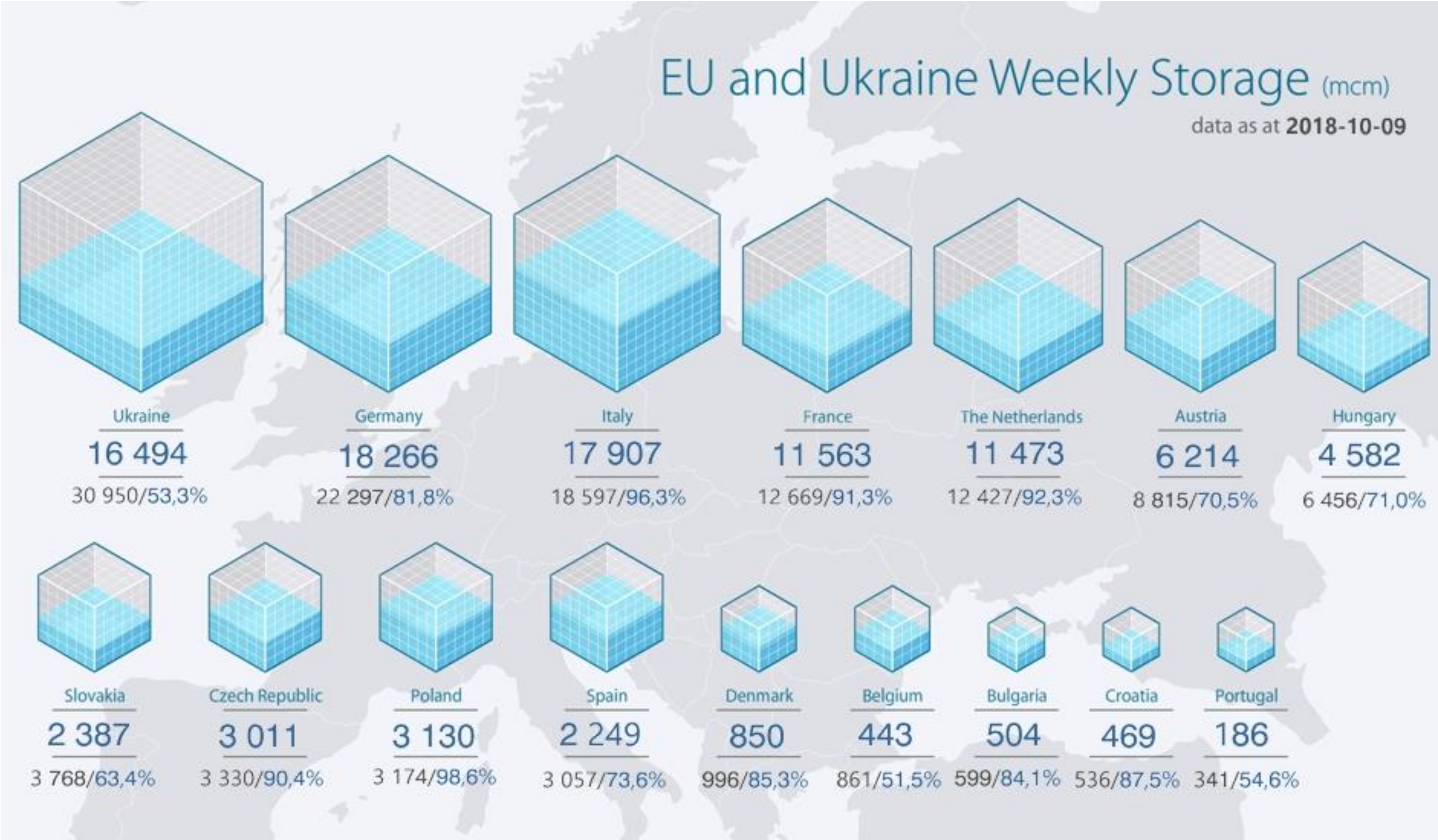
- 11 in depleted fields
- 2 in acquifer (incl.1 on the occupied territory

Underground gas storage of Ukraine (continue)

- *comparative analysis and ranking*

Ukrainian UGS - one of the biggest gas storage system of the world

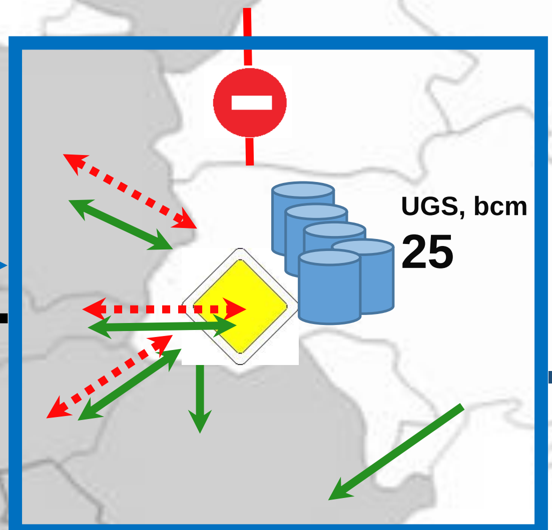
- 3rd rank by **Working gas volume** in the world



Development and goals (pipe gas)

Capacity to UA, bcm/year (2017/ tech)
14,1/21

Capacity to EU, bcm/year (2017/ tech)
93,5/146



UkrGasVydobuvannya

- Gas production increase Program 20/20
  - Increase efficiency field development
    - Intensification program

UKRTRANSGAS

- Improve capacity on EU-UA border
- Implements EU energy legislation (incl. IA)
- Participation in EU infrastructure initiatives
  - Seeking new developments
- Diversification routes of supply

Ukrainian gas corridor is one of the several routes of RU gas supply to EU…. but only one that Gazprom doesn't control!

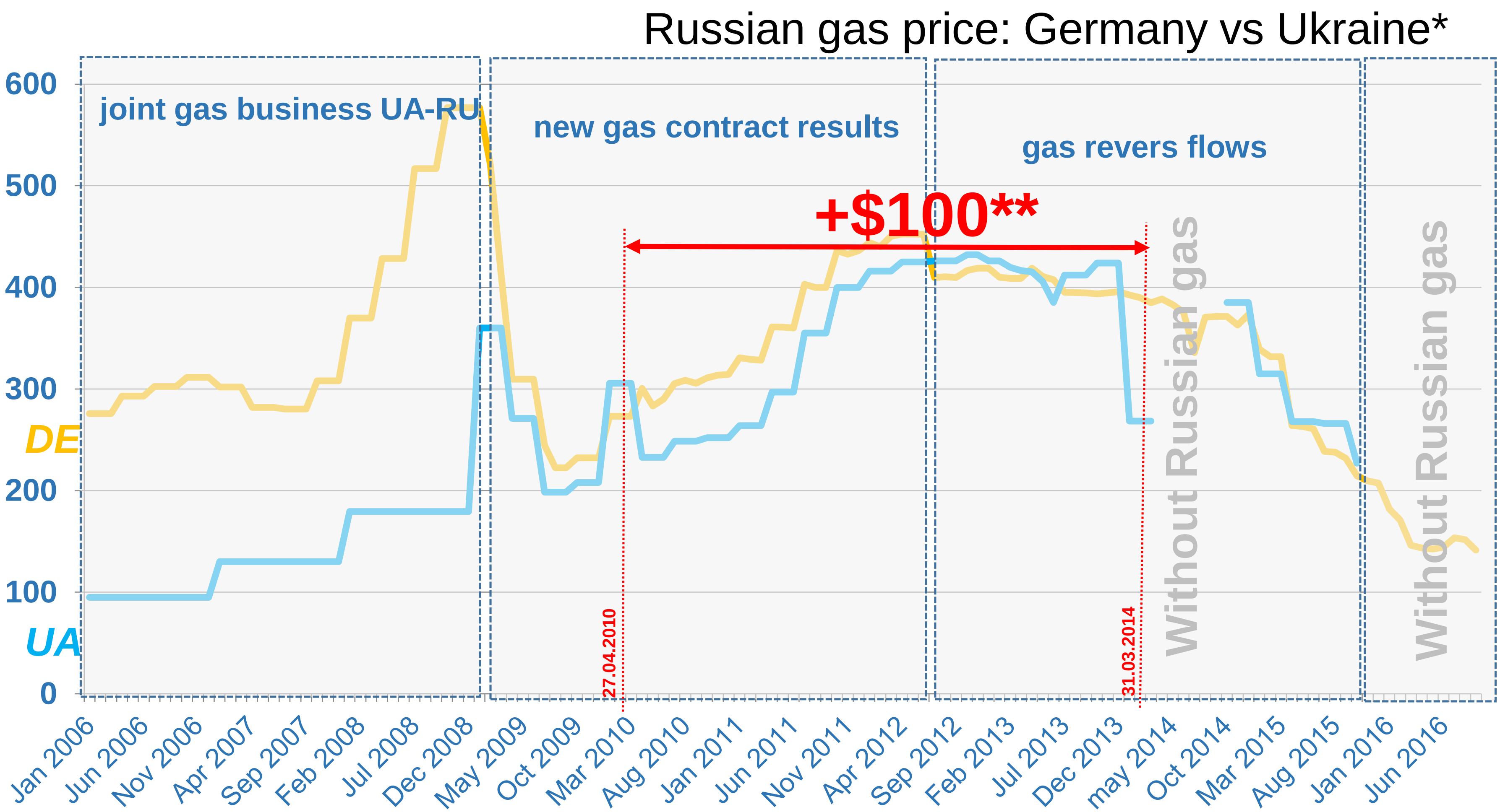
… it's real reason to discredit UA's gas corridor

Legend

Existing routes of supply
Existing routes blocked by Gazprom
New developments

LNG prospects in Ukraine

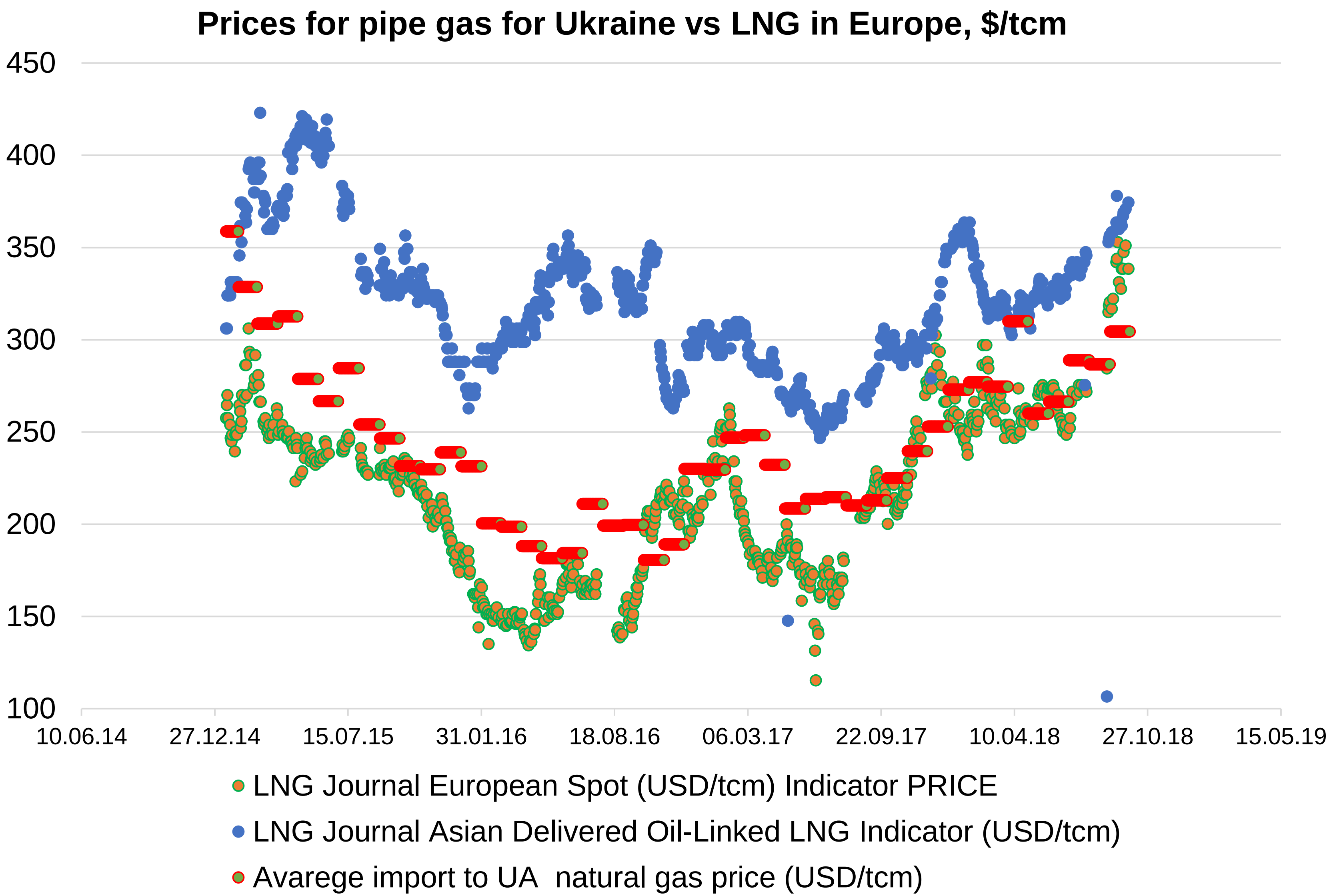
Russian gas prices for Germany vs Ukraine



** for Germany converted from original \$/MMBtu; ** Conditions: if RU gas price ≥\$330/tcm – discount is \$100, if ≤\$333/tcm – discount is 30%*

1096 days without Russian gas import (on 27.11.2018)

Market prices: pipe gas from Europe vs LNG



….. stable LNG competitiveness in question

Current status LNG-project in Ukraine

NAFTOGAZ GROUP

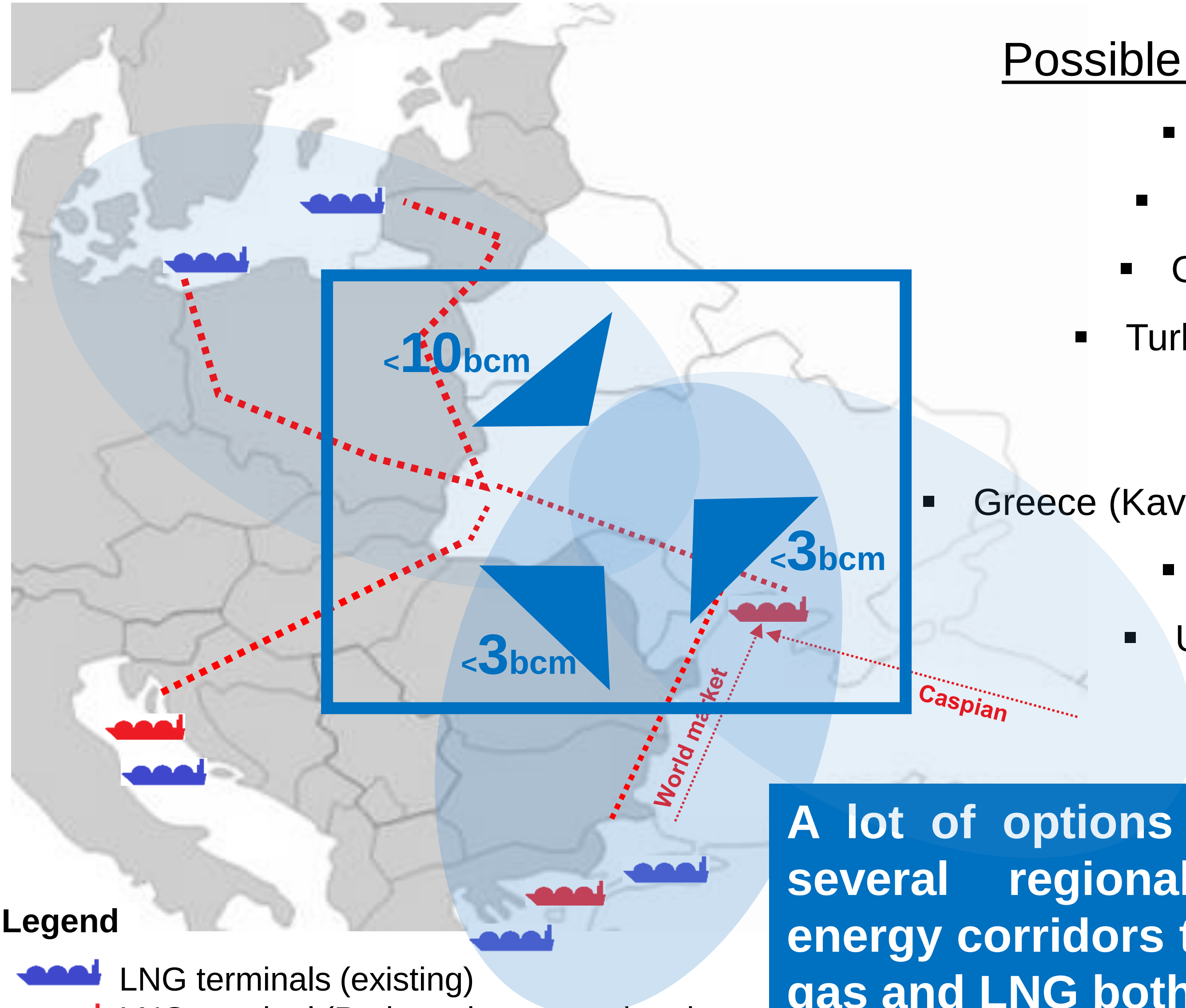
- There is a need for import and further diversification of gas supplies
- The State Enterprise "National Project" LNG Terminal“ was created in 2010 for the realization of the LNG project
- There were 2 feasibility studies for the LNG terminal (onshore and FSRU) developed
- There is interest from domestic companies and potential foreign investors in the implementation of the LNG project: financing, construction, supply and solve Bosporus pass issues (but needed State guarantees)
- In August 2017 est. a Working Group for resume consideration on the construction of a LNG terminal in Ukraine and to develop options for LNG supplies to Ukraine

LNG terminal benchmarks

	Commissioned projects		***Valuation for Ukraine***		
Type and name LNG terminal	**Onshore «Świnoujście»**	**FSRU «Independence»**	**Onshore**	**FSRU**	**FSRU**
Project executive	«Polskie LNG» (Gaz System)	«Klaypedos Nafta»	SE «LNG-terminal» (MEDT)	SE «LNG-terminal» (MEDT)	«TIS ltd», Odessagas
Place, year of commission	PL, Świnoujście, 2016	LT, Klaypeda, 2014	UA, Odessa, on entry of Yuzhny port	UA, Odessa, Yuzhny port, MNT Pivdenniy (JSC Ukrtransnafta)	UA, Odessa, Yuzhny port
Developer Feasibility study	SNC Lavalin (Canada)	BMGS (Latvia)	Socoin (Fenosa, Spain)	ILF Polska	n/a
Regasification capacity, bcm	5/7.5	4	10	5	5
Storage tanks	320 (2*160)/+1*160	170 (size FSRU vessel)	540 (3*180)	180 (size FSRU vessel)	(size FSRU vessel)
Additional facilities	-	Charter FSRU-vessel (owner Hoegh LNG)	-	Charter FSRU-vessel (owner Excelerate Energy)	Charter FSRU-vessel (owner n/a)
Construction period, years	>5	<3	3	9m - 4	4m-16 m
CAPEX, mln. €	**>950**	**~890 (200+690)**	**954.2**	**726.5 (36.5+690)**	**n/a (49+n/a)**

Sources: Analysis of the Department of Strategic Planning and Control

Developments and goals (LNG)



Possible routes & sources

- Lithuania (Klaipeda)
- Poland (Swinoujscie)
- Greece (Revithoussa)
- Turkey (Marmara Eriglisi)

Projected

- Greece (Kavala, Alexandropoulos)
- Croatia (Krk Island)
- Ukraine (near Odesa)

A lot of options to connect with several regional markets and energy corridors to receive natural gas and LNG both

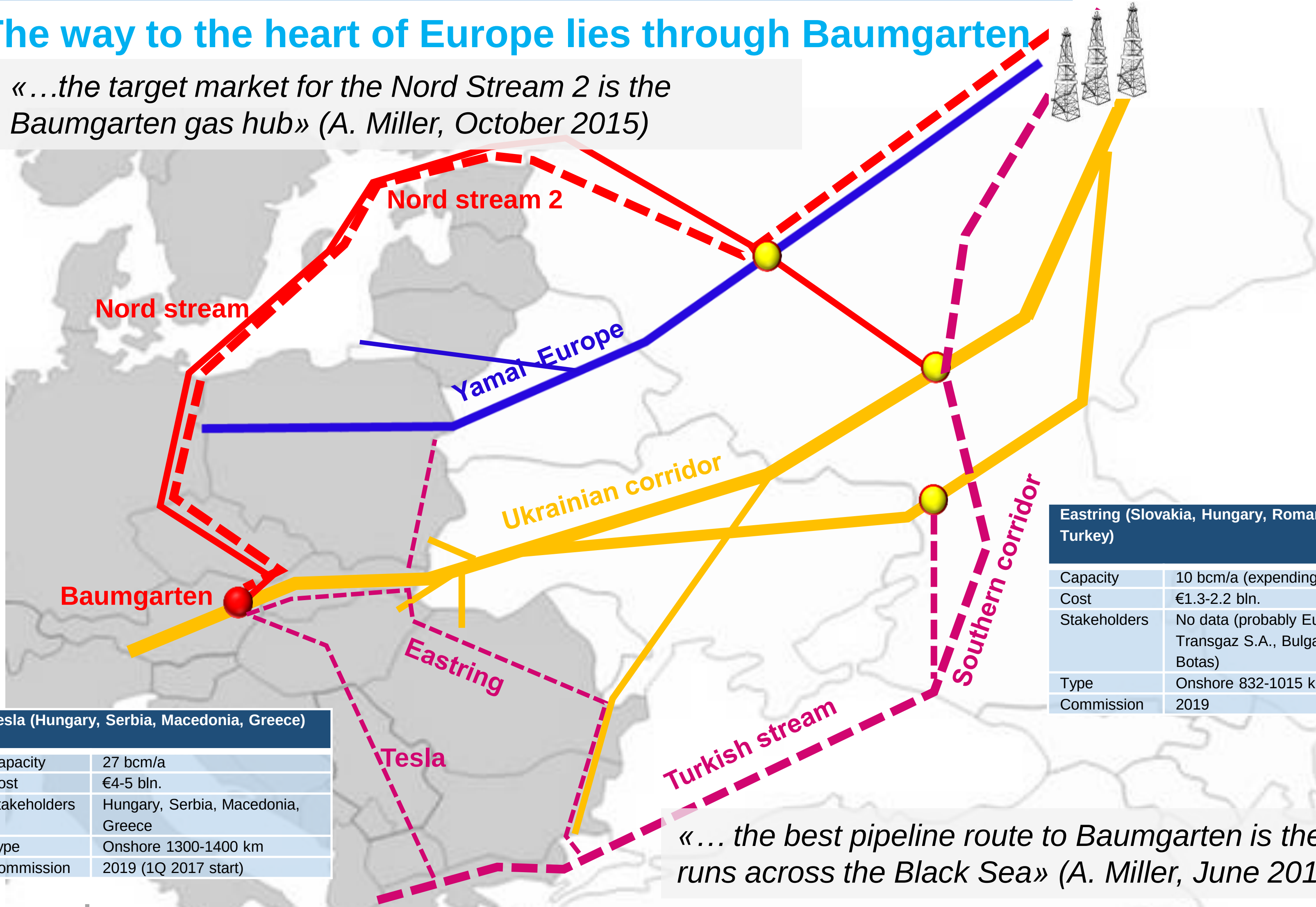
Legend

LNG terminals (existing)
LNG terminal (Projected, proposed and under construction)
<3bcm Potential of gas supply by corridors

„New“ Gazprom’s strategy

The way to the heart of Europe lies through Baumgarten

«…the target market for the Nord Stream 2 is the Baumgarten gas hub» (A. Miller, October 2015)



Tesla (Hungary, Serbia, Macedonia, Greece)	
Capacity	27 bcm/a
Cost	€4-5 bln.
Stakeholders	Hungary, Serbia, Macedonia, Greece
Type	Onshore 1300-1400 km
Commission	2019 (1Q 2017 start)

Eastring (Slovakia, Hungary, Romania, Bulgaria, Turkey)	
Capacity	10 bcm/a (expending to 20)
Cost	€1.3-2.2 bln.
Stakeholders	No data (probably Eustream, FGSZ, Transgaz S.A., Bulgartransgaz EAD, Botas)
Type	Onshore 832-1015 km
Commission	2019

«… the best pipeline route to Baumgarten is the one that runs across the Black Sea» (A. Miller, June 2015)

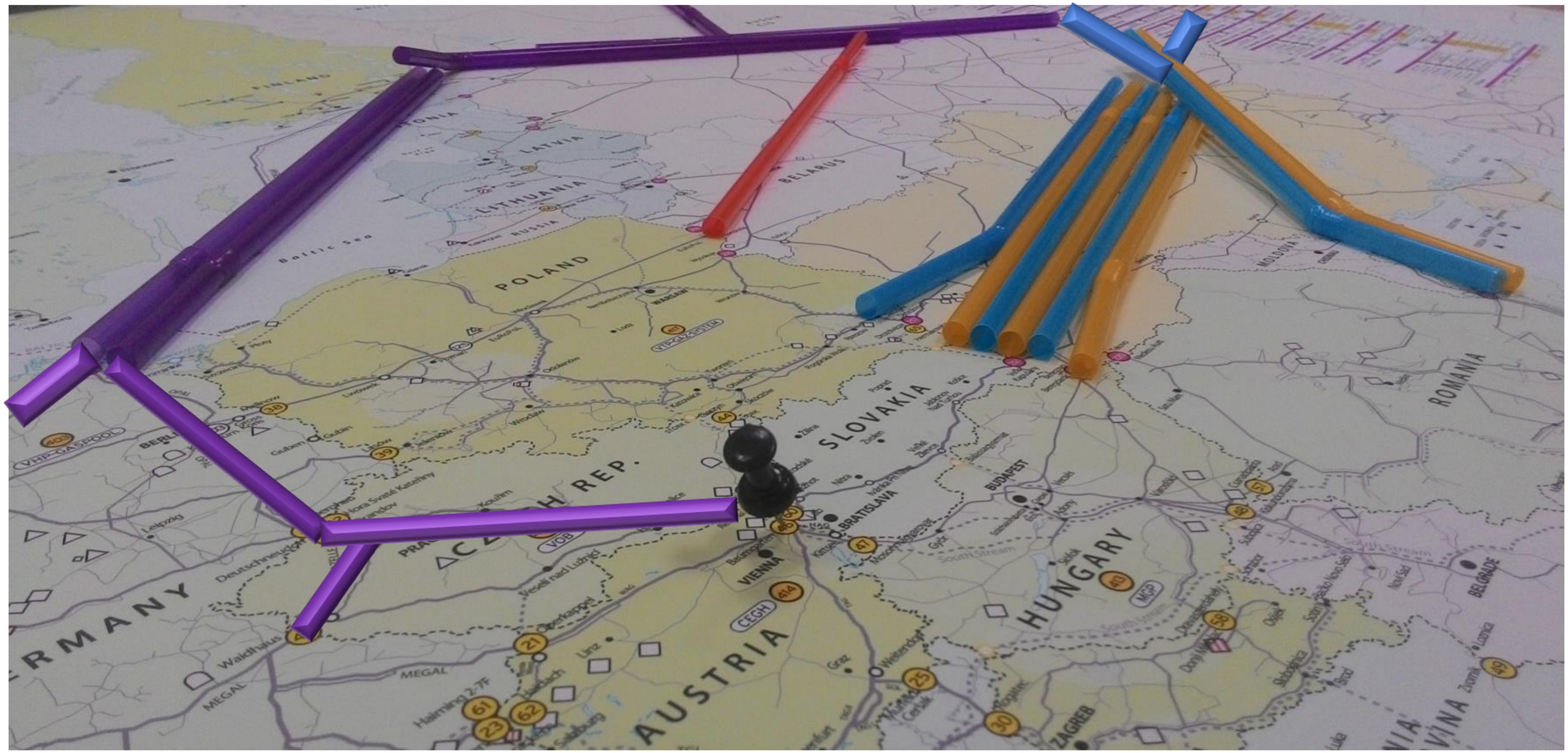
Legend

Existing routes and corridors — Projects — Points gas withdrawal — Baumgarten gas hub

… challengies & threats which presented as opportunities for EU

External threats: NS2 – challenge for EU

NAFTOGAZ GROUP



For NS 2 Gazprom need to create: **8500 km** of pipelines (in one line), including:

- **7 000** km to EU (4 600 km in RU, 2400 km offshore);
- **1 500** km in EU

… direct and shortest route
… without transit
… inexpensive gas transportation system

WHO WE ARE: Nafogaz's profile

NAFTOGAZ GROUP

Naftogaz's Business

Upstream, oil&gas processing

>15 bcm annual gas production

230+ oil, condensate, gas fields

39 gas processing plants

515 th t refinery volume

708 th t production of oil products

Gas transportation & storage

146 bcm transit capacity

93,5 bcm transit in 2017

~32 bcm domestic transmission

14.1 bcm gas import

30 bcm of underground gas storage facility

Wholesale gas trading

2012 –17 major importer

till 2012 monopoly importer

major wholesaler

100% supplier to households, DHCs

Oil transportation & storage

13,9 mln t transit in 2017

2,1 mln t domestic transmission in 2017

LPG production, transportation & storage

165,6 th t LPG production in 2017

133,4 th t LPG railway transport. in 2017

Gas business: ~90% of earnings

UKRAINE IS RELIABLE PARTNER IN GAS BUSINESS

NAFTOGAZ GROUP

…with huge technical capacities and big opportunity for cooperation.

Thank you very much for your attention!

Please find more information:

Official sites: www.naftogaz.com
http://naftogaz-europe.com

Annual report http://www.naftogaz.com/files/Zvity/Anual_report_eng_170608.pdf

Movie «Energize Ukraine» https://youtu.be/DAGAMObdXMI

Address: 6, B.Khmelnytskoho Str., Kyiv, 01601, Ukraine
e-mail: laktionov@naftogaz.com