Technical expertise to assess the prospects of LNG markets in the Eastern Partner countries

Presentation on Findings from Field Visits to EaP countries

3rd workshop of the Eastern Partnership sub-sectoral networking group on LNG Markets

20th September 2019, Kiev

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LNG Study Objectives – Approach

LNG Market Development Options

Findings & Applicable Options per EaP Country

Regional Perspectives for LNG Market Development

Next Steps

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Study Objectives

Core objective

*Enhance the **cooperation** and further the **energy market integration** between the EaP countries and the EU*

*by **assessing the prospects and promoting LNG** in the gas markets of the region*

Targeted results

- ✓ Assess current situation in EaP gas markets and **identify barriers** for LNG
- ✓ Formulate **recommendations for development of LNG** markets country-by-country and EaP as a whole
- ✓ **Strengthening awareness** of gas stakeholders in EaP countries on technical, market, and regulatory aspects of LNG, and particularly the use of LNG in the EU
- ✓ **Identify specific actions** to enhance trading, promote new infrastructure, improve market functioning and competition, fostering cooperation within EaP
- ✓ Further EU's **Energy Dialogue** with the EaP countries in regard to LNG

Outline LNG Study approach

Identification of applicable LNG market development options

- Desktop research
- Development of initial hypotheses on LNG options
- Validation of hypotheses during field visits and EaP workshop
- Shortlisting of applicable options for further analysis
- Collection of required data

Analysis of applicable options

- Definition of supply chain modalities and cost estimation for selected options
- Assessment of price competitiveness (netback analysis) for selected options
- Assessment of prerequisites and challenges

Detailing and prioritization of specific actions

- Monetizing benefits of the selected options
- High-level cost-benefit analysis of price competitive options
- Option prioritization & recommendations (including regional cooperation)

Start: end of May 2019

3rd EaP LNG Network Workshop (Kiev, 20/9/19)

4th EaP LNG Network Workshop (Świnoujście, Nov. 2019)

Final report: Dec. 2019 Stakeholder event: Q12020

Field Visits

- Field Visits to all 6 EaP countries undertaken June to September, aiming:
  - To **enhance gas stakeholders' awareness** on EU LNG strategy, market development, demand, supply, prices and key infrastructure, operational modalities of LNG terminals and 'virtual' gas pipelines involving LNG
  - To discuss with key stakeholders in each country the **current situation and prospects** for developing markets for LNG, barriers and prerequisites for market development
  - To reach a consensus with key stakeholders in each country on the **LNG market development options deemed applicable for the country**, and which merit further analysis to assess their cost effectiveness and economic viability

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LNG Market development options

LNG market development options can be grouped under two categories/cases:

Gas-to-Gas Competition

- LNG competes with natural gas, for existing gas customers, connected to the system
- Involves LNG regasification before it is used by final customers
- LNG constitutes an additional supply source or supply route for the country

Gas-to-Other Fuels Competition

- LNG competes with other fuels, for customers that currently do not use gas and not connected to the gas network
- Depending on the use it may be directly used (use in transport) or regasified (off-grid consumers)
- Use of LNG would have environmental benefits (reduction of GHG emissions)

LNG options for Gas-to-Gas competition

	Options for introducing LNG to the market
Gas-to-Gas competition	Pipelines (receiving regasified gas of LNG origin)
	LNG receiving terminal established at EaP country
	Transportation of LNG via trucks and trains (supplying LNG to existing natural gas grid-connected customers)
	Swaps (pipeline gas for LNG)

Features of Gas-to-Gas competition

- **A key precondition** for Gas-to-gas competition is that LNG derived gas is competitive in price against natural gas for end users. Otherwise they will not switch supplier
- However, even if gasified LNG is not price competitive against natural gas, there are security of supply benefits for the society and economy due to diversification of supply source/route provided by LNG supplies
- The above benefits are particular to each country and can be monetized. Using cost-benefit analysis, it can be assessed whether such benefits outweigh costs

LNG options for Gas-to-Other Fuels competition

Gas-to-other fuels competition

LNG supply options	Main uses of LNG
LNG receiving terminal with bunkering and truck loading facilities	Lorries that use LNG as fuel
	Ships that use LNG as fuel
	Agriculture and mining customers using LNG in processes and for moving equipment
LNG trucks (supplying LNG to new off-grid customers)	Off-grid customers (industrial, commercial, towns) that can use regasified LNG
Small Scale Liquefaction Facilities (liquification of piped gas and supply to customers via LNG trucks)	Old distribution systems (instead of investing in replacement of pipes)
	Remote gas production fields not connected to the gas network

Features of Gas-to-Other Fuels competition

- **Key preconditions** for the viability of Gas-to-other fuels competition:
  - LNG to be price competitive against other fuels
  - The LNG market size for the end-use to be sufficiently large and attractive, so as to justify investments
- Substituting current fuels with LNG will result in energy cost reduction and in environmental benefits by reducing the use of more polluting fuels
- The above benefits are particular to each use and each country and can be monetized. Using CBA for those cases where LNG is price competitive compared to other fuels, economic attractiveness can be assessed

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Overview

- The options for LNG market development applicable to each EaP country were identified in discussion and cooperation with the key country stakeholders
- All country stakeholders were very interested and keen to support the study and the process
- The financial and economic viability of the applicable options will be examined in the next stage of the study, and will flag those options that are considered attractive
- Applicable options identified are in line with the geographic location, market and specificities of each EaP country

Armenia – Key Findings (1/2)

- Armenia has limited import routes for LNG and lacks proximity to LNG sources.
- Gazprom Armenia has monopoly on gas imports and is the owner/operator of the transmission system
- Armenia appears to have a sizable international long-haul traffic (export/imports and transit) and heavy-duty work trucks, that could merit the use of LNG as truck fuel. The transport sector predominantly uses CNG (~85%) and diesel (~15%)

Armenia – Key Findings (2/2)

- The country has a wide network of CNG filling stations (380), most quite old, which are in need of modernization and could be converted to also use LNG (L-CNG)
- Gazprom Armenia is interested in establishing a small scale liquefaction facility to convert piped gas into LNG. Alternatively, LNG could be sourced through Georgia (e.g. Black Sea LNG terminal with truck loading facility or containerized LNG shipped to sea port and then transported by truck/rail to Armenia) or sourced by truck from Russia

Armenia – Applicable LNG Options

Options for Gas-to-Gas Competition

No option identified

Options for Gas-to-Other Fuels Competition

- LNG as engine fuel for **trucks**

Azerbaijan – Key Findings (1/2)

- Currently, all gas production in Azerbaijan available for export has already been contracted. However, new fields under development could potentially supply an export route to a liquefaction terminal in Georgia over the mid-term
- The liquefaction terminal in Georgia could also be supplied with gas from Kazakhstan and Turkmenistan, e.g. in case an LNG receiving terminal is built at the Azeri Caspian Sea coast
- Around 95% of the Azeri territory is gasified. Government roadmap targets 100% gasification, and development of LNG virtual pipelines is assessed, as a means for supplying off-grid areas

Azerbaijan – Key Findings (2/2)

- Azerbaijan appears to have sizable international long-haul traffic. Transport fuels are subsidised and development of an LNG supply chain for trucks would not be financially attractive. The use of LNG, as fuel for long-haul trucks, merits consideration, especially for environmental reasons
- A new port in Baku is operational, and a new shipyard is under development by SOCAR, while Azerbaijan has the largest fleet active in the Caspian Sea. Development of LNG as fuel for ships is of interest to authorities, especially for environmental reasons
- No prospects seem to exist for the use of LNG in agriculture or mining

Azerbaijan – Applicable LNG Options

Options for Gas-to-Gas Competition

- Supply of an export route to a **liquefaction terminal** in Georgia

Options for Gas-to-Other Fuels Competition

- LNG as engine fuel for **trucks**
- LNG as engine fuel for **ships**
- LNG supplies to the remaining **off-grid areas** in Azerbaijan, to increase gasification

Belarus – Key Findings (1/2)

- Belarus does not consider reverse flow of existing interconnections (Poland, Lithuania) technically feasible, and no new interconnections are planned. Several interconnections with Ukraine are decommissioned and/or unutilized
- Import of LNG from EU using trucks and/or trains, appears to be feasible
- Belarus has a special interest in using LNG as motor fuel for trucks, as the country is home to manufacturers of trucks and heavy work vehicles (MAZ, BELAZ), which have already launched pilot projects for LNG fuelled vehicles

Belarus – Key Findings (2/2)

- Belarus has a number of waterways where passenger or cargo ships operate, making use of LNG as fuel a possibility
- Gazprom Transgas Belarus is considering a small-scale liquefaction facility primarily for supply of LNG to filling stations
- LNG use in agriculture has very limited potential. CNG is used, 50% of users are connected to the grid and the national strategy is to promote biomass and peat for energy use

Belarus – Applicable LNG Options

Options for Gas-to-Gas Competition

- Supply of **LNG via trucks**, from Lithuania Poland and Ukraine (if LNG terminal or small scale liquefaction is developed)
- Supply of **LNG via rail**, from Poland

Options for Gas-to-Other Fuels Competition

- LNG as engine fuel for **trucks**
- LNG as engine fuel for **ships**

Georgia – Key Findings (1/2)

- Currently there is no possibility for Georgia to receive regasified LNG through its gas pipeline interconnections with Russia, Armenia and Azerbaijan
- Georgia is interested to establish LNG liquefaction port terminal for exporting LNG to Ukraine, Moldova (via Ukraine) and possibly Romania. This option is subject to availability of Azeri gas (seems possible only over the mid-term)
- Georgia could also consider development of an LNG receiving terminal (smaller size than the one in Ukraine), provided Turkey allows LNG vessels' passage through the Bosporus Straits

Georgia – Key Findings (2/2)

- Georgia appears to have a sizable international long-haul traffic (export/imports and transit), that could merit the use of LNG as truck fuel
- Over 80% of customers are connected to the grid but LNG supply to selected off-grid consumers (mainly mountainous resort areas etc.) could be an option
- GOGC interested to establish small scale liquefaction facility to supply LNG filling stations and off-grid remote consumers

Georgia – Applicable LNG Options

Options for Gas-to-Gas Competition

- Establishing **LNG export terminal** in Black Sea (enabling gas-to-gas competition in Ukraine and other countries)
- Establishing **LNG receiving terminal** in Black Sea
- **Swaps** of LNG landing in Turkish terminals for pipe gas contracted by Turkey through South Caucasus Pipeline

Options for Gas-to-Other Fuels Competition

- LNG as engine fuel for **trucks**
- LNG supplies to **off-grid customers** in mountainous resort areas

Moldova – Key Findings (1/2)

- Currently import prices of Russian gas (only supplier of the market) are lower than LNG. However, regasified LNG supplies through existing interconnections (Ukraine) and future ones (Romania) are of interest, for diversification of supply purposes
- Supplies of regasified LNG in case the receiving terminal in Ukraine is built are of interest, due to the proximity of the Moldovan system to Odessa
- All towns are gasified and reportedly off-grid consumers are not interested to use gas

Moldova – Key Findings (2/2)

- The international long-haul traffic through Moldova is very small. There is also very limited vessel traffic in Moldovan waterways. Therefore there seems to be no potential for LNG in transport sector
- Moldova has no gas storage and gas flows fluctuate significantly. Use of small-scale LNG storage for peak shaving at the Chisinau and Belts District CHP stations can enhance security of energy supply

Moldova – Applicable LNG Options

Options for Gas-to-Gas Competition

- Supply of **regasified LNG** via pipelines, potentially from the terminals of Poland, Lithuania, Croatia, Italy, Greece, Turkey, and Ukraine (if the receiving terminal is built)

Options for Gas-to-Other Fuels Competition

- **LNG storage for peak shaving** at Chisinau and Belts District CHP stations

Ukraine – Key Findings (1/3)

- There are multiple pipeline routes through which regasified LNG can be imported (Poland, Slovakia, Hungary, Romania). Some of these routes would require investments to allow LNG supply, i.e. to lift bottlenecks (Hungary and Poland) or allow reverse flow (Romania)
- LNG import does not involve route diversification, and therefore price competitiveness is the key driver
- Discontinuation or significant decrease in Russian transit, affects Ukraine import capacities, thus reducing LNG supply potential

Ukraine – Key Findings (2/3)

- Ukraine is interested to establish an LNG receiving terminal near Odessa. This is contingent upon agreement between Ukraine and Turkey to allow LNG ships passing through the Bosporus Straits
- Ukraine has road and rail connections to Poland (and on to Lithuania), and may import LNG by trucks and train
- Ukraine appears to have sizable international long-haul traffic (export/imports and transit) that merits the use of LNG as fuel for trucks
- A large number of passenger and cargo ships regularly operate in Ukrainian waterways, especially Dnieper and Black Sea ports, making use of LNG as fuel a possibility

Ukraine – Key Findings (3/3)

- The Ukrainian gas network is well developed, and most consumers are gasified. There are cases of very old gas distribution sections that can be replaced by LNG virtual pipelines, instead of heavily investing in rehabilitation
- Most consumers in agriculture and mining are already connected to the gas network. Limited potential for LNG, only as backup fuel in agriculture or heavy work tractors' fuel in mining
- There are gas fields the connection of which to the network is not viable. Small-scale liquefaction can be applied to develop them, and studies for such projects are carried out

Ukraine – Applicable LNG Options

Options for Gas-to-Gas Competition

- Supply of **regasified LNG** via pipelines, potentially from the terminals of Poland, Lithuania, Croatia, Italy, Greece, Turkey
- Establishing **LNG receiving terminal** in Black Sea
- Supply of **LNG via trucks**, from Poland, Lithuania
- Supply of **LNG via rail**, from Poland

Options for Gas-to-Other Fuels Competition

- LNG as engine fuel for **trucks**
- LNG as engine fuel for **ships**
- LNG supplies to off-grid customers, especially in **agriculture and mining**
- LNG virtual pipelines in **distribution systems** instead of large rehabilitation investments in distribution systems
- LNG virtual pipelines to connect **remote gas fields** with off-grid customers

Summary of applicable LNG development options

							
Gas-to-Gas Competition	1. Supply of regasified LNG with pipelines					✓	✓
	2. LNG receiving terminal				✓		✓
	3. LNG supply via trucks			✓			✓
	4. LNG supply via trains			✓			✓
	5. Swaps				✓		
Gas-to-Other Fuels Competition	1. LNG-fuelled trucks	✓	✓	✓	✓		✓
	2. LNG-fuelled ships		✓	✓			✓
	3. Agriculture and mining consumers						✓
	4. Off-grid customers		✓		✓		
	5. Replacement of old distribution pipes with LNG supply						✓
	6. Exploitation of remote gas fields						✓
	7. Peak shaving LNG storage					✓	

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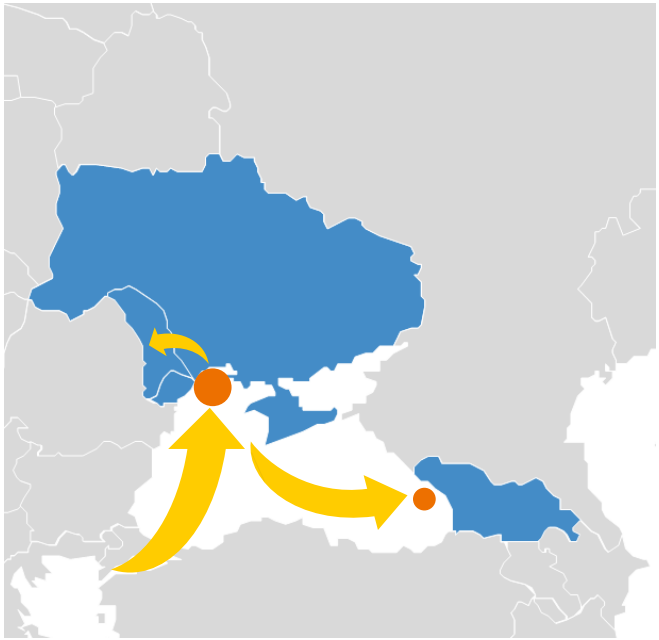
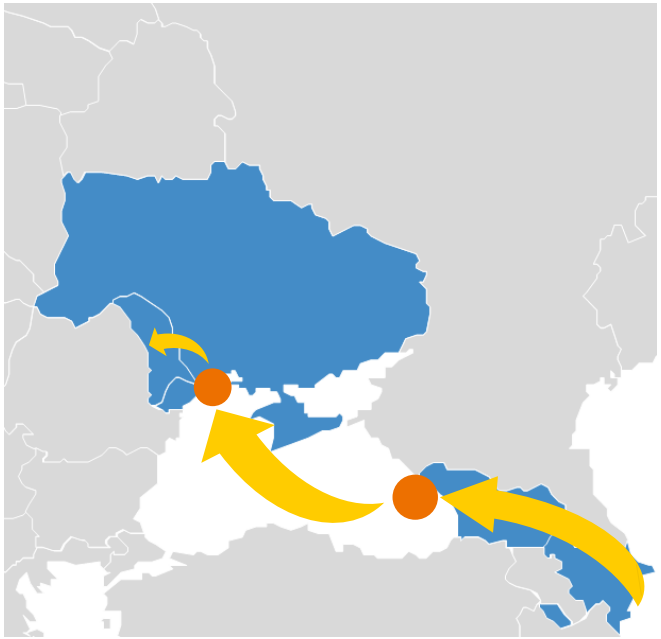
LNG terminal in Ukraine



- Potential development of the LNG terminal in Ukraine (subject to a Ukraine – Turkey agreement for the Bosporus Straits) can facilitate LNG supply to other EaP countries:
  - Regasified gas can be supplied to Moldova through the Ukrainian system
  - Georgia can develop a small LNG terminal, to receive shipments from Ukraine

Liquefaction terminal in Georgia



- Development of a liquefaction terminal in Georgia for exports of Azeri gas (subject to export potential in Azerbaijan) can develop a corridor for LNG supply to EaP countries:
  - LNG shipments at an LNG receiving terminal in Ukraine
  - Regasified gas can be supplied to Moldova through the Ukrainian system

LNG Filling Stations

Source: Natural & bio Gas Vehicle Association (NGVA Europe)

By establishing LNG or CNG-L filling stations in Ukraine and Belarus, as well as in Armenia and Georgia, a cluster is formed together with Polish and other European stations, enabling LNG to be effectively used by long haul lorries moving goods from East to West & Central Europe

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- Netback analysis and market sizing will be carried out for each of the identified applicable LNG market development options, so as to define the options that could be financially viable and to filter out non-competitive ones
- For the purposes of the analysis, the study Consultants have already requested information and data from EaP country coordinators and stakeholders, part of which has been received. The continuing support of EaP countries in addressing data gaps is vital for the integrity of the analysis
- Preliminary results of the LNG options will be presented during the next EaP Workshop in Poland