

# STORAGE AND ITS ROLE IN TURKEY'S GAS CHAIN

LADISLAV GORYL, UGS DIRECTOR

9 – 10th October, 2018

17<sup>th</sup> ERRA INVESTMENT CONFERENCE



# AGENDA

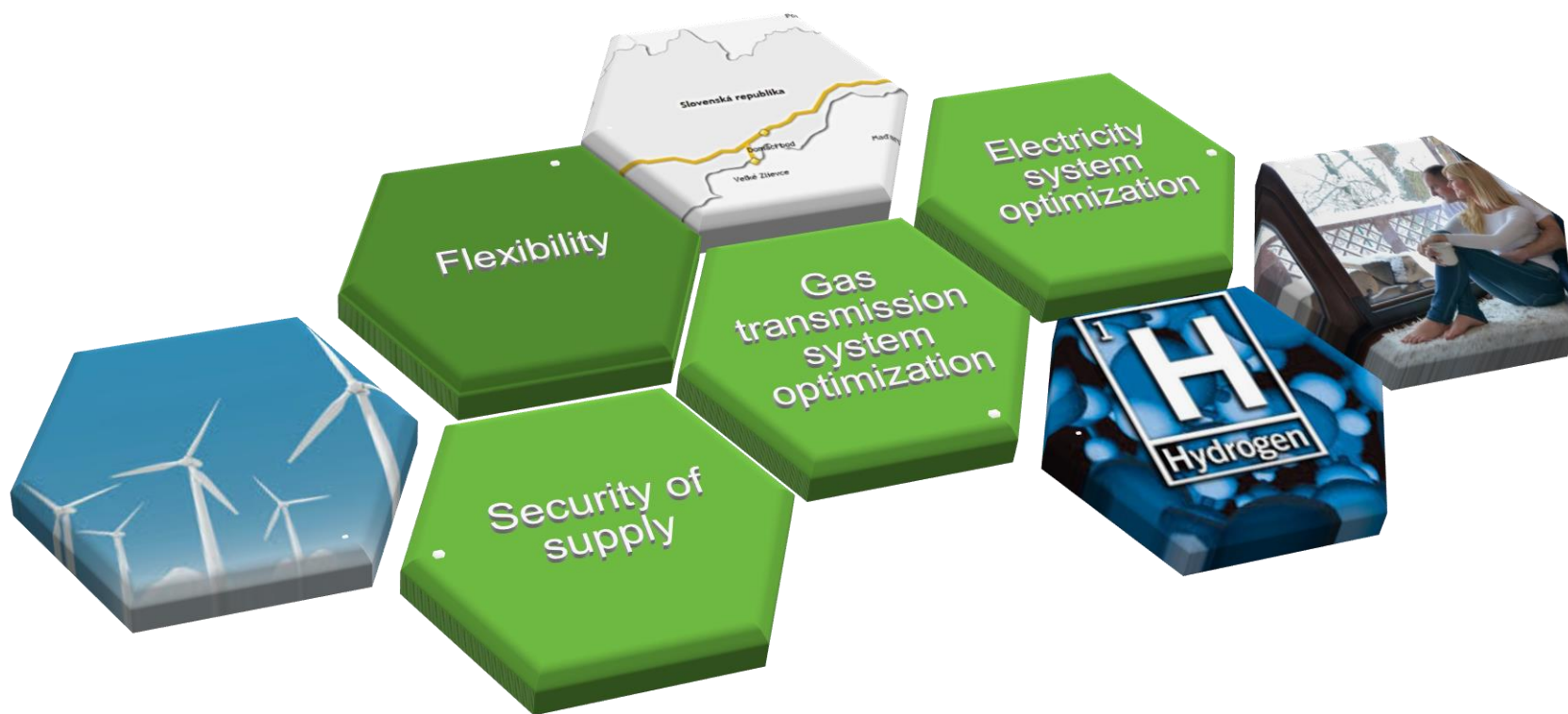
1. **ROLES OF UNDERGROUND GAS STORAGE (UGS)?**
2. **WHY TURKEY NEEDS UGS INVESTMENTS?**
3. **HOW MUCH, WHERE & HOW UGS TO BE DEVELOPED?**
4. **WHO IS NAFTA?**

A grayscale photograph of an industrial facility, likely a refinery or chemical plant. The image shows a complex network of pipes, metal walkways, and large storage tanks. In the foreground, there are several large cylindrical vessels and a network of pipes. In the background, more industrial structures and tall chimneys are visible against a cloudy sky. The overall scene is industrial and technical.

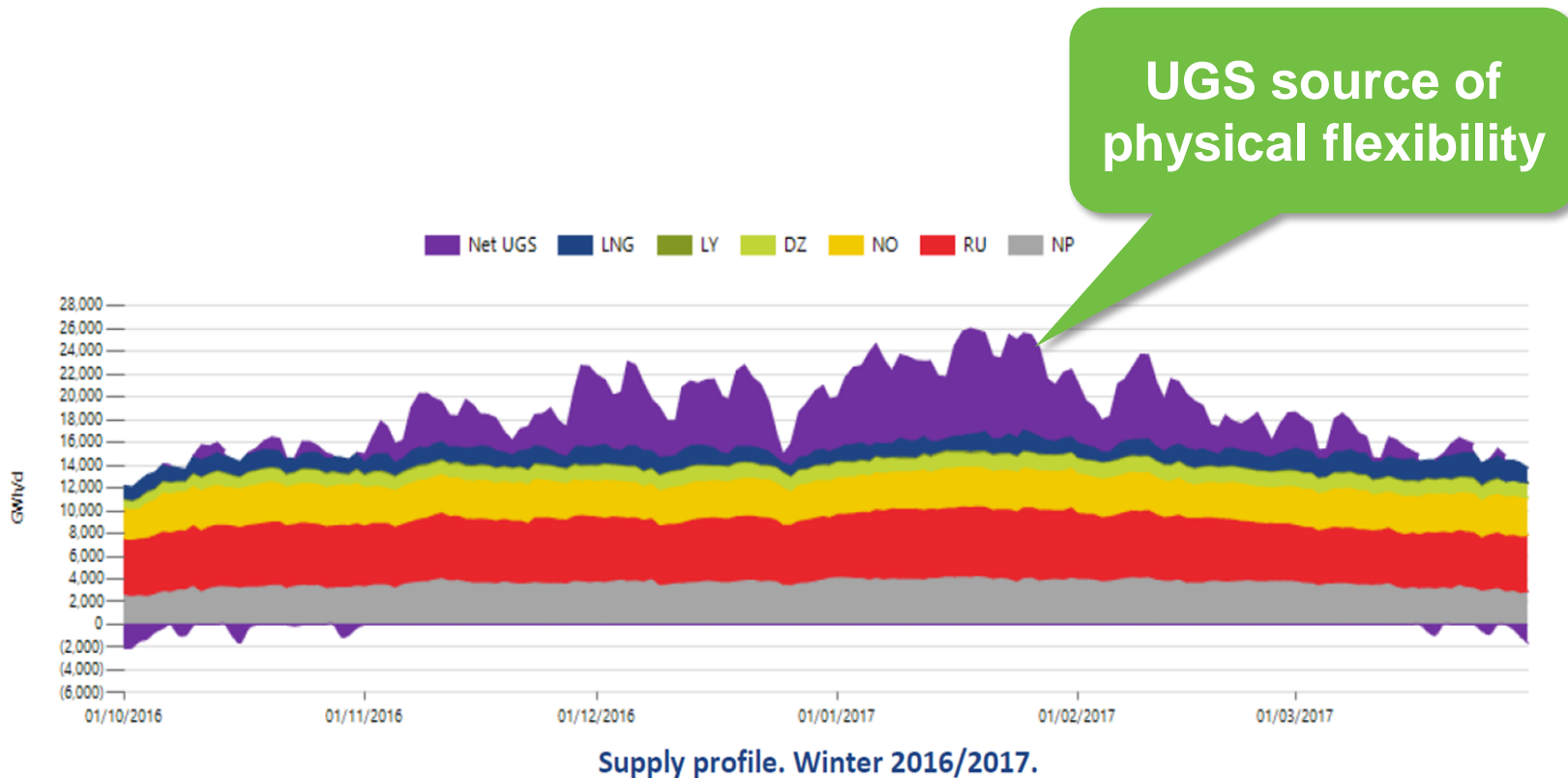
# 01

## **ROLES OF UNDERGROUND GAS STORAGE (UGS)?**

# UGS ROLES



# TRADITIONAL ROLE: FLEXIBILITY VALUE



Source: ENTSOG

The bigger the Party, the bigger...  
Submitted review of gas suppl...  
The importance of gas stor...  
Submitted review of gas suppl...  
Submitted review of gas suppl...

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Taylor & Francis Online

Journal  
**International Journal of Environmental Studies** >  
Volume 73, 2016 - Issue 3: Natural Gas & Energy Storage

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Original Articles

# The importance of gas storage facilities in the European gas and power markets

Jack D. Sharpley

Pages 168-178 | Published online: 01 May 2016

Download citation

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Abstract

Natural gas plays a significant role in providing heat and power to European energy consumers, while demand fluctuates both on a seasonal basis and within single days. As intermittent renewable energy sources account for an increasing share of EU electricity generation, natural gas will grow in importance as a complementary fuel but will also face even greater fluctuations in demand. This article highlights the vital role of gas storage facilities in meeting fluctuating gas demand and thereby contributing to stable electricity generation in the EU. If the EU continues to depend on gas imports in a flexible gas trading market, the storage of gas will become more important for effective market activity and security of energy supplies.

**Keywords:** Natural gas, Electricity generation, Energy security

ANKARA, Dec 22 (Reuters) - Turkey's daily natural gas consumption has risen to more than 200 million cubic meters due to increased household demand in cold weather and is outpacing supply, energy industry sources said on Thursday.

compensated. <http://www.bible.org>



A large-scale construction site for the TANAP gas pipeline. Several yellow cranes are lifting a massive black pipe section into place. Workers in safety gear are visible on the ground. The background shows a hilly landscape under a clear sky.

By Reuters  
Thursday, 22 December 14:35 GMT

**At least 1000 people have died in conflict and under-reported stories we share a light on the world's humanitarian hotspots**

From major disaster, conflicts and under-reported stories, we share a light on the world's humanitarian hotspots

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(Updates with electricity prices)

By Orhan Cokdemir and Humeysra Pamuk

ANKARA, Dec 22 (Reuters) - Turkey's electricity prices rose to their highest in years, as natural gas consumption soared due to higher household demand amid cold weather, forcing state pipeline operator Borsas to cut supplies to power plants and advise industries to reduce output.

Turkey's daily natural gas consumption has risen to above 200 million cubic metres in December; gas industry sources said, from around 175-180 million last month and in same period last year due to colder

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11:27 Five die results of 4th Open American & Tokyo Japan Representative Championship (16/07/16)

11:19 - Prices for building steel also in fluctuation zone

11:03 - There's a few more people died in Oakland Foundation for Africa fundraising

11:02 - Which day to go shopping

Page 1 of 1

1/2

Anna Shryazovskaya and Mathew Carr  
1 oktobra 2019 6:00

- Environmental rules push up demand for clean-burn fossil fuel
- Consumers hope that rising LNG supplies will ease their pain

Europe's consumers might not know it, it is drenched by the theft of electric energy.

October's arrival marks the first day of winter in the world of natural gas trading, what's unusual this year is that wholesale prices are already more than 10% at levels in a decade – even before the season's first cold snap.

**In this article**

The surge stems from European policy makers' efforts to increase penalties for coal burning at a moment when that China shows more clean fuels to

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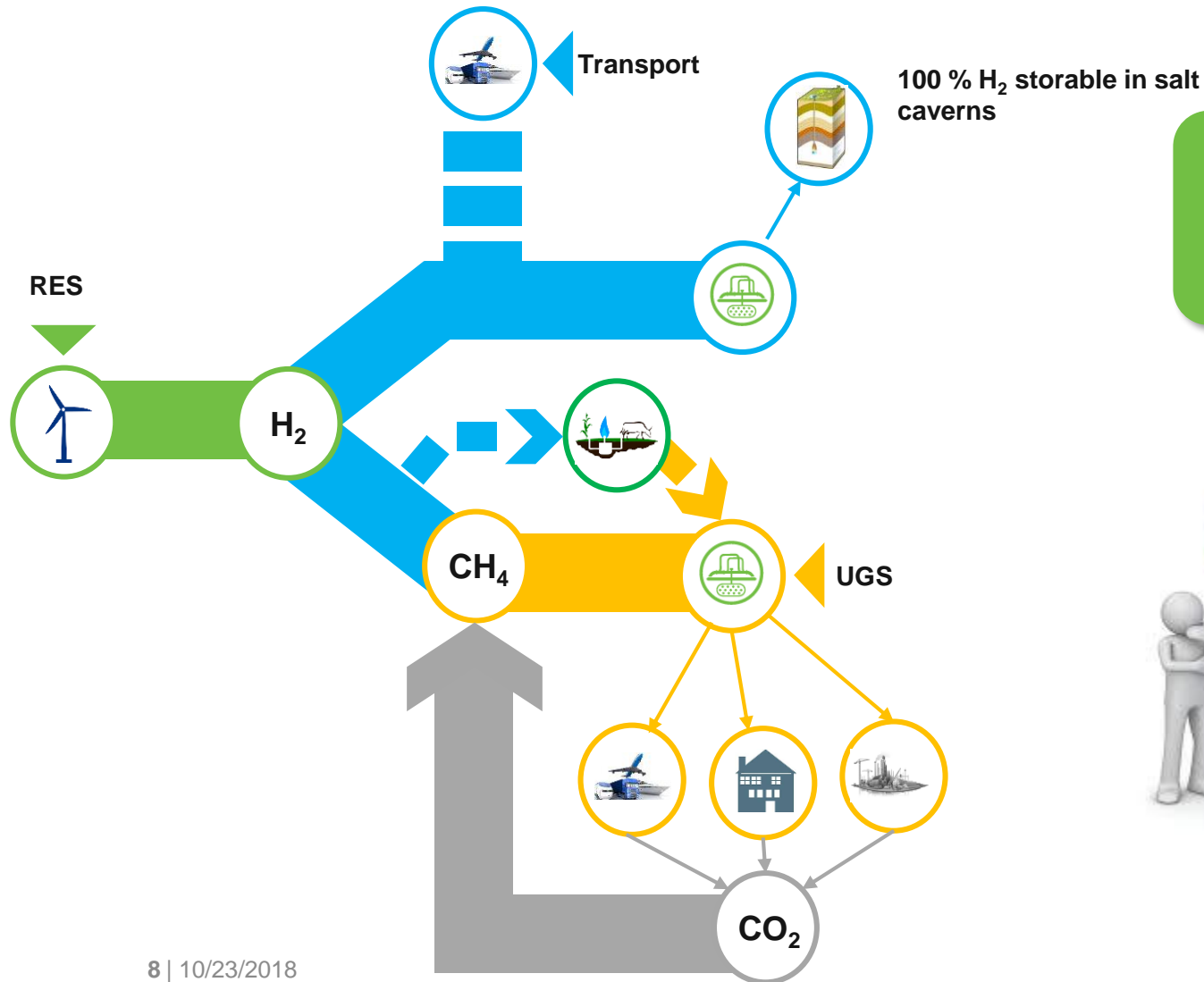
### Nine Rivers

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Stocks Drop as Treasuries Take  
Break; Dollar Rises; Markets Wrap

# FUTURE ENERGY SYSTEM VALUE





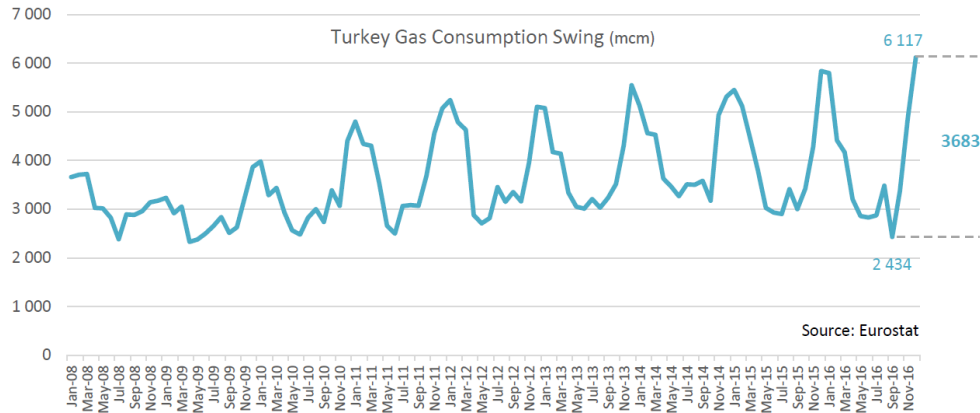
A grayscale photograph of an industrial facility, likely a refinery or chemical plant. The image shows a complex network of pipes, metal walkways, and large cylindrical storage tanks. In the foreground, there are several large horizontal pipes and a vertical tank. The background features more industrial structures and tall chimneys under a cloudy sky. The overall scene is industrial and technical.

# 02

## **WHY TURKEY NEEDS UGS INVESTMENTS?**

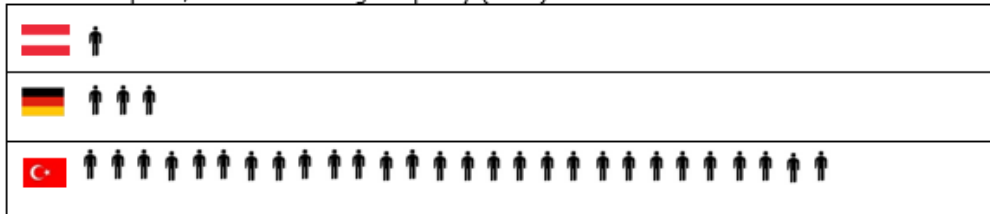


# TURKEY HAS INSUFFICIENT STORAGE CAPACITIES






- Gas power generation has decreased due to energy policy **but overall consumption is set to raise**
- Growing trend of end users & eligible customers

Inhabitants per 1,000 m3 of Storage Capacity (2015)



- Growing population 1-2%/y steadily
- Residential sector growing
- **High residential swing up to 10!**

# TO SECURE PHYSICAL BALANCING YOU NEED CERTAIN SIZE OF GAS MARKET CAPACITY

<i>mcm/day</i>				
Entry capacity	Domestic production	0,25	45	2
	Pipeline	220	700	140
	UGS	40	600	40
	LNG	0	0	56
	<b>TOTAL</b>	<b>260</b>	<b>1300</b>	<b>238</b>

vs.

Total peak daily consumption

40

600

>230





Ratio

$6 > 1$

$2 > 1$

ca.  $1 = 1$

# FOR TURKEY THE MOST EFFICIENT FLEXIBILITY AND SECURITY OF SUPPLY TOOL IS UGS

<div>○</div> <div>●</div> <div>\$</div> <div>\$\$\$\$\$</div> <div>- low SoS</div> <div>- high SoS</div> <div>- low cost</div> <div>- high cost</div>		Investment cost for additional mcm/day	Cost of gas	Security of supply increase	Comments
Domestic production		\$\$\$	\$	●	<ul style="list-style-type: none"> <li>Cost effective</li> <li>...but depends on future exploration findings</li> </ul>
Pipeline		\$\$\$\$\$	\$\$\$\$\$	○	<ul style="list-style-type: none"> <li>Very expensive for flexibility use and limited SoS</li> <li>Suitable for base load</li> </ul>
UGS		\$\$\$	\$\$\$	◐	<ul style="list-style-type: none"> <li>Most efficient large scale option</li> <li>Limited to verified reservoir</li> <li><b>Second best after domestic production</b></li> </ul>
LNG		\$\$\$	\$\$\$\$\$	◑	<ul style="list-style-type: none"> <li>Very expensive for flexibility of use and limited increase of SoS</li> <li>Suitable for base load</li> </ul>

... but pipelines & LNG do not solve Take or Pay!

# TURKEY AT THE CROSSROAD OF GAS FLOWS



## EXISTING ENTRY PIPELINES

- West Lines
- Blue Stream
- Baku Tbilisi Erzurum
- Erzurum Tabriz Ankara

## UNDER CONSTRUCTION PIPELINES

- TANAP
- Turkish Stream 1 & 2

## POTENTIAL PROJECTS

- Mediterranean pipeline

Source: EMRA

**Lots of pipelines under construction are to be export pipelines ...  
but UGS are a backbone of any reliable & flexible gas flows**

A grayscale photograph of an industrial facility, likely a refinery or chemical plant. The image shows a complex network of pipes, metal walkways, and large storage tanks. In the foreground, there are several large cylindrical vessels and a network of pipes. In the background, more industrial structures and tall chimneys are visible against a cloudy sky. The overall scene is industrial and technical.

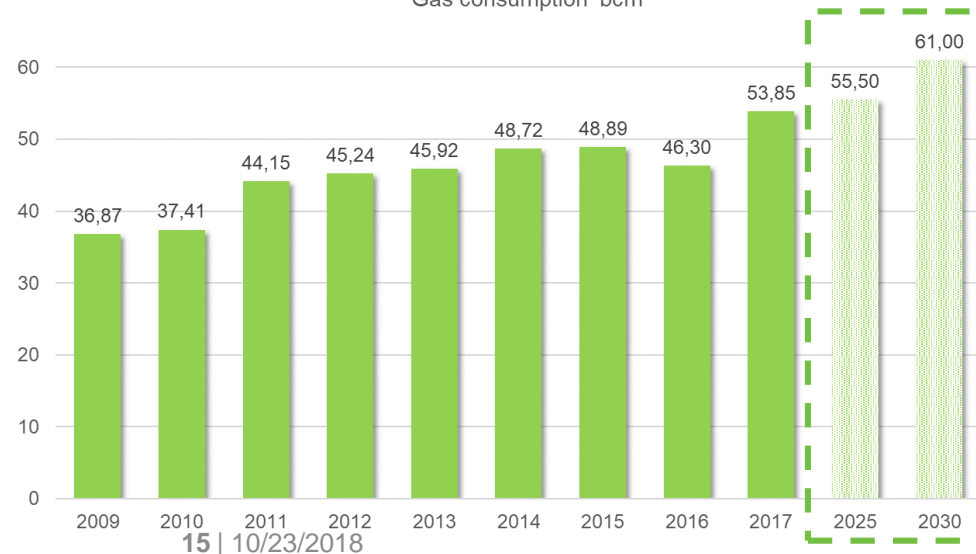
# 03

**How MUCH, WHERE & HOW UGS TO BE DEVELOPED?**

# HOW MUCH UGS TURKEY NEEDS?



Gas consumption bcm



WGV (bcm)	Existing	Projects	Total
Tuz Golu	1,2	4,0	5,2
Silivri	2,7	1,5	4,2
Tarsus		4,0	4,0
Others		?	?
<b>Total</b>	<b>3,9</b>	<b>9,5</b>	<b>13,4</b>

## YEARLY CONSUMPTION

- **ca.10-13 bcm** of total WGV @ 20-25% of current gas consumption

## SECURITY OF SUPPLY

- **ca.5 bcm** of additional WGV if N-1 rule applied and SoS to be delivered by storages

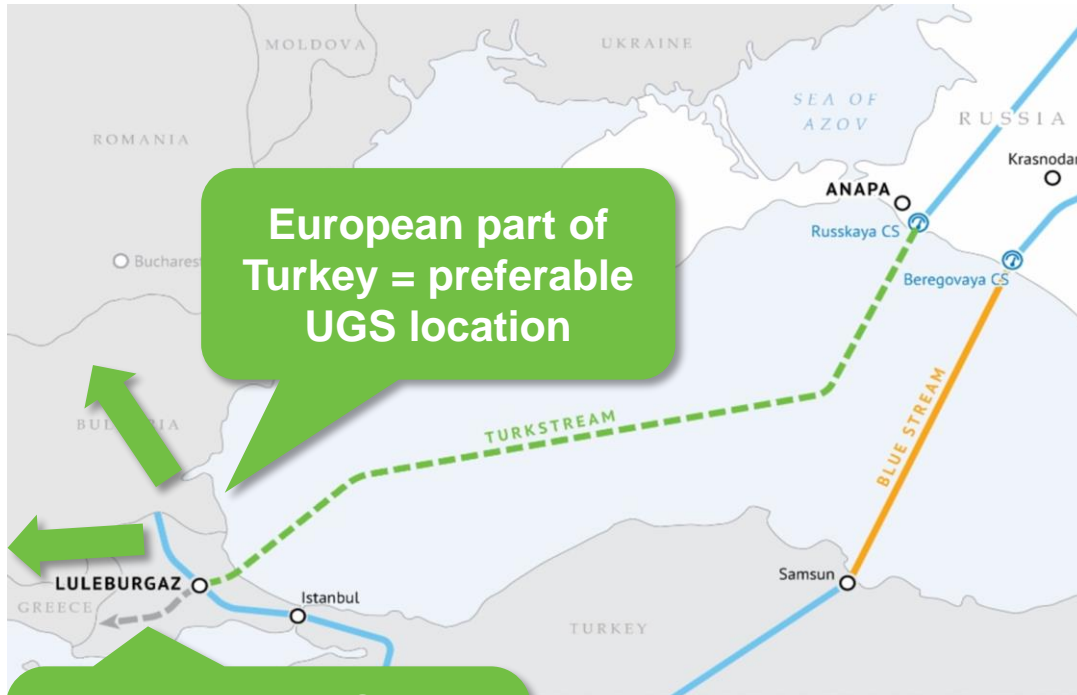
## BALANCING

- Additional extra WGV needed for transmission

## ENERGY STORAGE ?



# WHERE STORAGE IS NEEDED?



## CLOSE TO LARGE CONSUMPTION CENTERS

- Population in cities is a main flexibility driver
- In the area with suitable geological conditions
- The most efficient development of gas storages is in porous reservoir

## CLOSE TO TRANSMISSION SYSTEMS

- At the point of change of gas title
- Near the entry/exit from / to transmission system
- At gas systems flows crossroads
- As part of „Potential gas hub“

# HOW TO DEVELOP EFFICIENT STORAGE?

## SUPPORT FDI

- Creating investor attractive environment
- Securing investment with long term offtake contract
- Matching currency of investment with currency of tariff/storage fees

## POTENTIAL INVESTORS

- Gas storage companies
- Gas shippers & exporters
- Energy companies





# 04

## Who is NAFTA?

# NAFTA IS LEADING UGS PLAYER IN CEE

- **Key Slovak Underground Storage Operator**

- ~ Operating unique storage assets **UGS Lab complex 2.6 bcm**
- ~ Portfolio of **7** geological structures
- ~ Variety of grid interconnections, strategic location
- ~ **Exporter of gas storage capacity**



**KNOW-HOW  
& EXPERIENCE**  
105+ years **E&P**  
45+ years **UGS**

- **UGS Technical operator**

- ~ **POZAGAS** 0.65 bcm
- ~ **SPP Storage** 0.57 bcm



**RELIABILITY & FLEXIBILITY**  
Storage capacity

- **Strong competence centre**

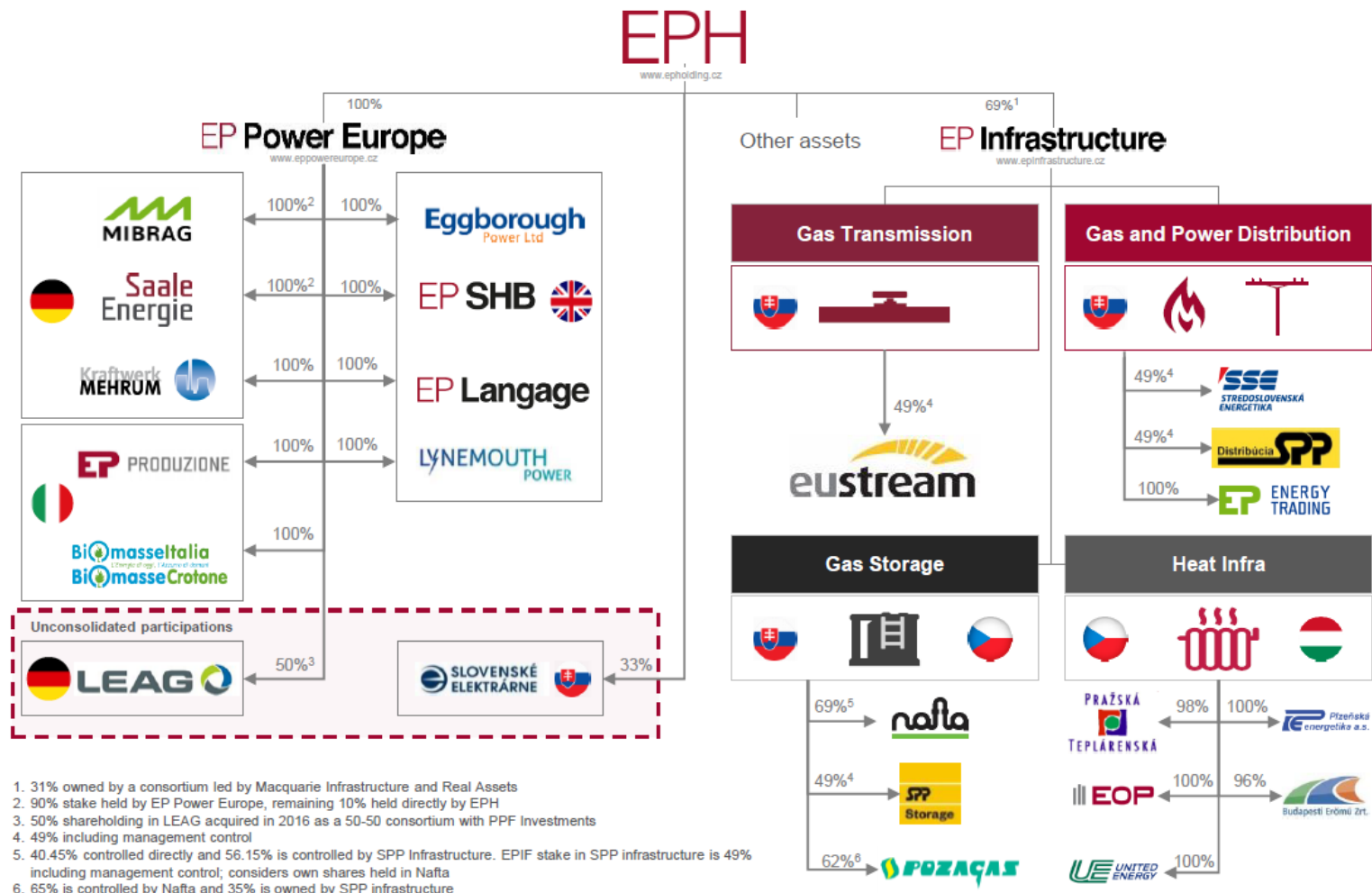
- ~ Subsurface & Surface
- ~ Commercial
- ~ Partner of RAG at **Sun storage project**
- ~ Member of DVGW



**ENVIRONMENTAL  
& INNOVATIVE**  
Energy storage  
cooperation



# NAFTA — PART OF EPH GROUP





# NAFTA: PART OF PROJECT OF SUN STORAGE

NAFTA was a partner of the Austrian company RAG in **unique power-to-gas project**

- providing solutions for the storage of the **renewable energy** in **gas reservoir**
- installing a demonstration plant for in-situ testing
- investigating the impact of **the mixture of hydrogen** and **natural gas** for the porous underground gas storage



The project **has confirmed** a feasibility of energy storage in the form of mixture H<sub>2</sub> & CH<sub>4</sub> in porous reservoir



**THANK YOU FOR YOUR  
ATTENTION!**

