

# GAZ-SYSTEM S.A. activities on methane emissions reduction

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Kraków, 13.10.2011

# AGENDA

1. GAZ-SYSTEM S.A. – brief introduction
2. International and national cooperation
3. Projects on methane emissions
4. Daily actions
5. Summary

# 1. GAZ-SYSTEM S.A. – BRIEF INTRODUCTION

## 1.1 General information

Transmission System Operator GAZ-SYSTEM S.A.:

- ❑ Established in 2004 as a State Treasury Company of strategic importance;
- ❑ Designated as Transmission System Operator by the President of the Energy Regulatory Office;
- ❑ Transmits natural gas to the distribution networks and end users;
- ❑ Owner of Polskie LNG.

# 1. GAZ-SYSTEM S.A. – BRIEF INTRODUCTION

## 1.2 Facts & Figures (1)

**Over 2000  
employees**

**Head Office  
in Warsaw**

**6 branches:  
Gdańsk, Poznań,  
Rembelszczyzn,  
Świerklany,  
Tarnów,  
Wrocław**



# 1. GAZ-SYSTEM S.A. – BRIEF INTRODUCTION

## 1.3 Facts & Figures (2)

9 777 km of pipelines

Transmission of over  
14 bcm  
of natural gas

15 compressor  
stations

970 exit points



## 2. INTERNATIONAL AND NATIONAL COOPERATION

### 2.1 Membership in European associations

- ❑ Gas Infrastructure Europe (GIE )
  - ❑ Gas Transmission Europe (GTE)
  - ❑ Gas LNG Europe (GLE)
- ❑ European Network of Transmission System Operators for Gas (ENTSOG)
- ❑ European Gas Research Group (GERG)
- ❑ Marcogaz

# 2. INTERNATIONAL AND NATIONAL COOPERATION

## 2.2 International partnerships

- ❑ Natural Gas Star International
- ❑ Battelle Memorial Institute - ICF Resources
- ❑ International Gas Union (via PZITS – The Polish Association of Civil Engineers&Technicians)

# 2. INTERNATIONAL AND NATIONAL COOPERATION

## 2.3 National level

- Institute for Oil and Gas
- Warsaw University of Technology
- Silesian University of Technology
- Warsaw University of Life Sciences
- And others.....



# 3. PROJECTS ON METHANE EMISSIONS

## 3.1 Reduction of natural gas emissions

- Environment protection
- Public safety
- Improvement of economic indicators
- Company image

# 3. PROJECTS ON METHANE EMISSIONS

## 3.2 Emission from transmission system

To reduce emissions, it is necessary to:

- ❑ Identify emission sources
- ❑ Estimate emission quantity
- ❑ Calculate economic viability
- ❑ Eliminate sources of emissions

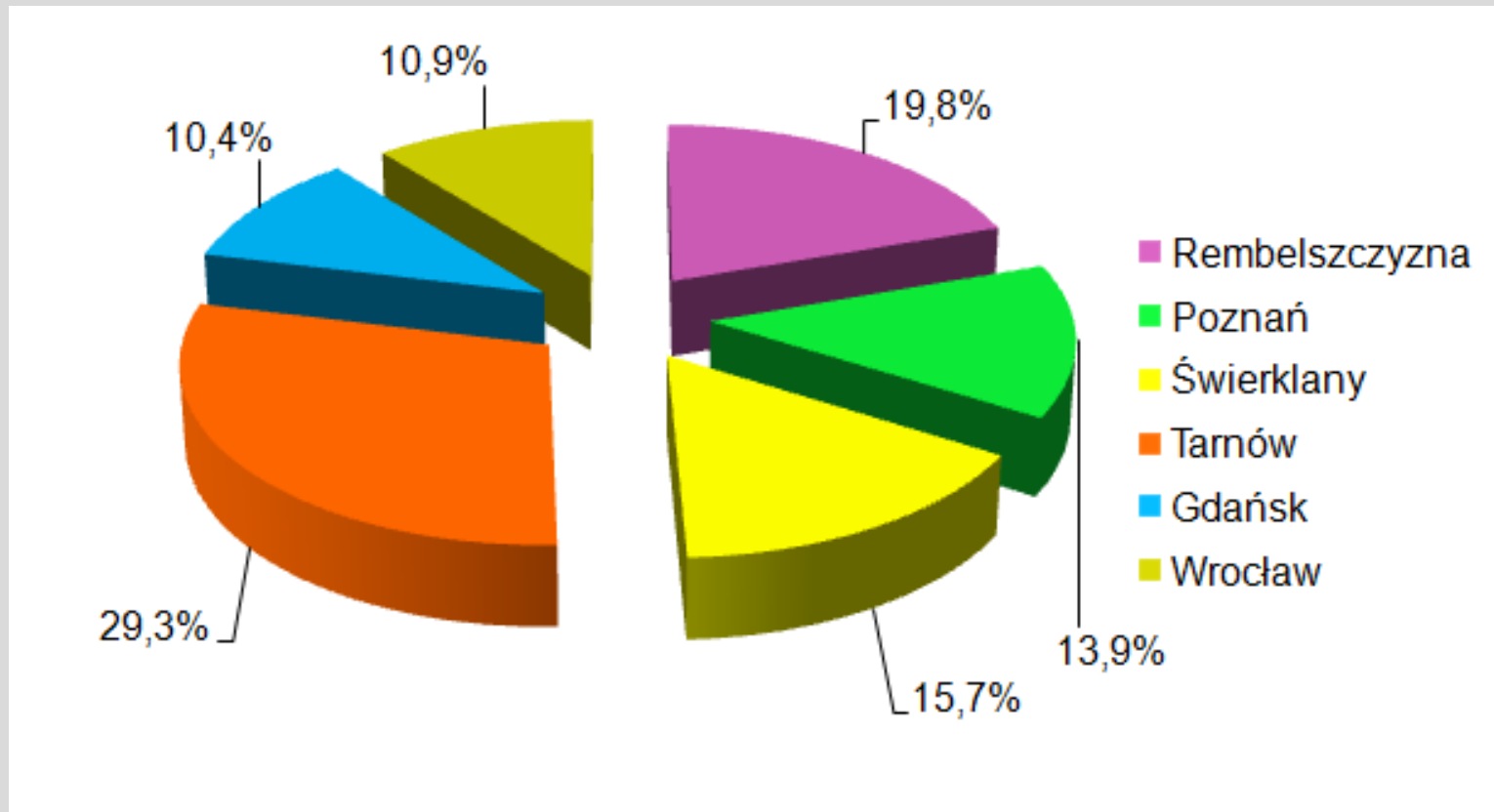
# 3. PROJECTS ON METHANE EMISSIONS

## 3.3 Emissions inventory

- ❑ Emissions from M&R stations, compressor stations, pipelines – coefficients were assigned
- ❑ Gas releases to the atmosphere due to maintenance works and breakdowns – amount of gas is calculated from available data

# 3. PROJECTS ON METHANE EMISSIONS

## 3.4 Percentage of natural gas emissions



# 3. PROJECTS ON METHANE EMISSIONS

## 3.5 Partnership of NGS

- ❑ improvement of emission coefficients;
- ❑ inventory of emission sources;
- ❑ assessment of the amount of emissions resulting from technological processes;
- ❑ assessment of the amount of fugitive emissions resulting from leakages

# 3. PROJECTS ON METHANE EMISSIONS

## 3.6 Cooperation with ICF

The aim was to analyze data using ICF's proprietary software

- ❑ GAZ-SYSTEM S.A. provided necessary information on three of the six branches;
- ❑ ICF prepared the draft analysis on emissions inventory;
- ❑ The next step is to prepare a report on reducing methane emissions from the transmission system.

# 3. PROJECTS ON METHANE EMISSIONS

## 3.7 Cooperation within GERG

2010 - a project on best practices on natural gas emission measurement methods was completed.

- ❑ Participants – 7 European companies;
- ❑ Results:
  - ❑ the best available method - Air Flow Method;
  - ❑ Its disadvantage – no ATEX certificate

# 3. PROJECTS ON METHANE EMISSIONS

## 3.8 Methods of emissions measurements

Method	Type of emission	Measuring range	Uncertainty
Method using foil	Fugitive emissions	from 0.0018 m <sup>3</sup> /h	To 10%
Method with air flow (Hi Flow Sampler)	Fugitive and pneumatic emissions	0.09 – 14 m <sup>3</sup> /h	Up to 10%
Method of bags of known capacity	Organized emissions	0.3 –30 m <sup>3</sup> /h	Approx. 10%
Methods with flow meters	Organized emissions	Depends on the device	2 – 10%



# 3. PROJECTS ON METHANE EMISSIONS

## 3.9 METHODS OF EMISSIONS MEASUREMENTS

Method	Type of emission	Measuring range	Uncertainty
Remote plume sensing method	Emissions from structure sources	0.01 kg/h 1 km. 1 ppm	10 – 15%
Tracer method	Emissions from structure sources	---	
Flux chamber method	Emissions from surfaces	Several cm <sup>3</sup> /m <sup>2</sup> /h – several thousand cm <sup>3</sup> /m <sup>2</sup> /h	To 10%
Calculation method	All kinds of emissions, especially vented	---	---

# 3. PROJECTS ON METHANE EMISSIONS

## 3.10 GERG projects

2011 - a new project proposal is discussed:

„Comparison of results obtained with different approaches to measurement of natural gas emissions – Air Flow Method and a method specified in EPA 21 (or EN 15446 standard)”

## 3. PROJECTS ON METHANE EMISSIONS

### 3.11 Method specified in EN 15446 standard

- ❑ Measurement of gas concentration on the surface of a leak source by portable device;
- ❑ Conversion of concentration to leak rate by using experimental correlations, which give coefficients for equation:

$$ER=A(SV)^B,$$

ER – emission rate, kg/h;

SV – screening value, ppm.

# 3. PROJECTS ON METHANE EMISSIONS

## 3.12 Air Flow Method

### Air Flow Method

- Quantity of gas emitted is sucked together with air;
- Flowrate of gas and air mixture is measured;
- Methane concentration in the gas mixture for two different flowrates is measured;
- Results are consistent up to 10%.

# 3. PROJECTS ON METHANE EMISSIONS

## 3.13 Projects with INIG

- ❑ Verification of emission coefficients from M&R stations;
- ❑ Methods for emissions detection from transmission system;
- ❑ Emissions measurements from compressor stations – Part I and Part II.

# 3. PROJECTS ON METHANE EMISSIONS

## 3.14 Methods of emissions detection (1)

- Remote aerial detection system;
- Portable leaks detector;
- Infrared camera;
- Flame ionisation detector;

## 3. PROJECTS ON METHANE EMISSIONS

### 3.15 Methods of emissions detections (2)

- Portable semiconductor detector;
- Portable catalitic detector;
- Detection with the use of surfactants.

# 3. PROJECTS ON METHANE EMISSIONS

## 3.16 Aerial detection of methane leaks – ALMA system





# 3. PROJECTS ON METHANE EMISSIONS

## 3.17 Aerial detection of methane leaks - CHARM system



# 3. PROJECTS ON METHANE EMISSIONS

## 3.18 Portable remote methane emissions detector - RMLD



# 3. PROJECTS ON METHANE EMISSIONS

## 3.19 Portable remote methane emissions detector - LASERMETHANE™ SA3C05A



# 3. PROJECTS ON METHANE EMISSIONS

## 3.20 Measurements of emissions in gas compressor stations



### Compressors:

- turbine compressors with combustion engines
- reciprocating compressors with combustion engines
- electrically driven reciprocating compressors

# 3. PROJECTS ON METHANE EMISSIONS

## 3.21 Measurements of emissions in gas compressor station at Rembelszczyzna



# 3. PROJECTS ON METHANE EMISSIONS

## 3.22 Measurements of emissions in gas compressor stations

The largest emission sources:

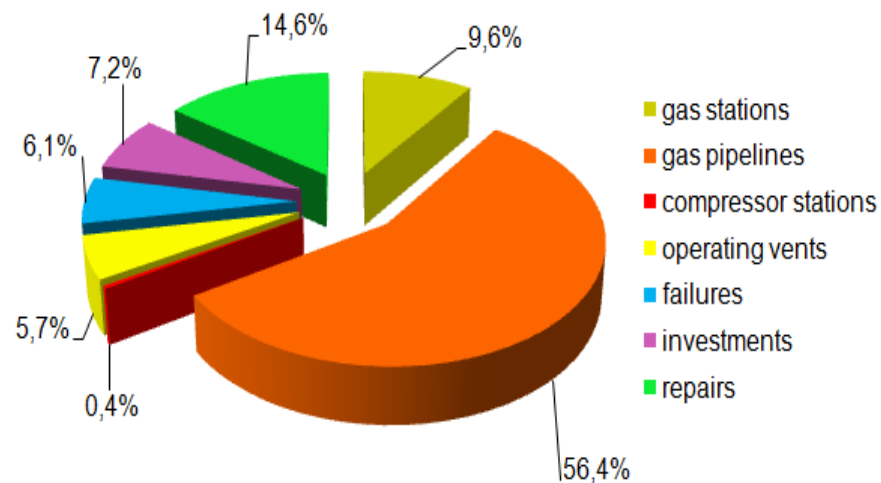
- ❑ Fugitive emissions
  - ❑ Valves of different types
  
- ❑ Vented emissions
  - ❑ Venting columns



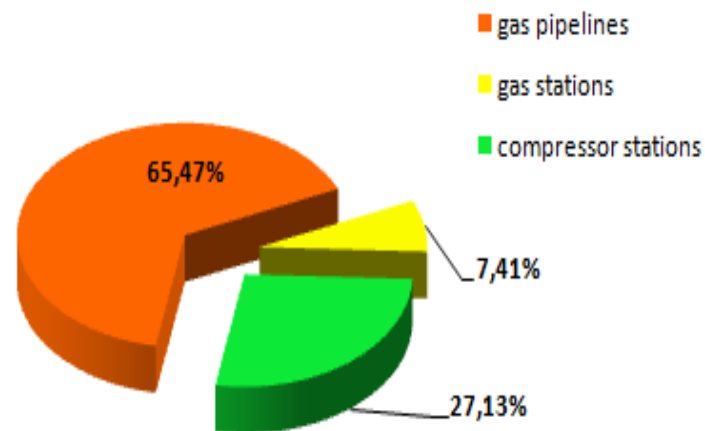
# 3. PROJECTS ON METHANE EMISSIONS

## 3.23 Percentage of methane emissions

All branches – old coefficients



Branch I – new data



## 4. DAILY ACTIONS

### 4.1 Modernization & Investments 2009-2010 (1)

- ❑ Replacement of needle valves on ball valves;
- ❑ Elimination of liquid separators;
- ❑ Modernization of existing compressor stations;
- ❑ Modernization of stop and bleed assemblies.



## 4. DAILY ACTIONS

### 4.2 Modernization & Investments 2009-2010 (2)

- ❑ Two compressor stations - in Goleniów and Jarosław;
- ❑ 34 M&R stations;
- ❑ 84,6 Km of new pipelines.

# 5. SUMMARY

## GAZ-SYSTEM S.A activities on methane emissions reduction

- ❑ Commitment to the reduction of GHG, including CH<sub>4</sub>;
- ❑ Development of own procedures for emission inventories;
- ❑ Cooperation with many companies and associations on projects related to methane emissions reduction;
- ❑ Use of modern technologies for emissions detection and measurement;
- ❑ Repairs and modernization of transmission system elements.

# Thank you for your attention

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