

# Gazprom Greenhouse Gas Emissions Study: Accounting, Monitoring and the Best Available Technologies of Emissions Reduction

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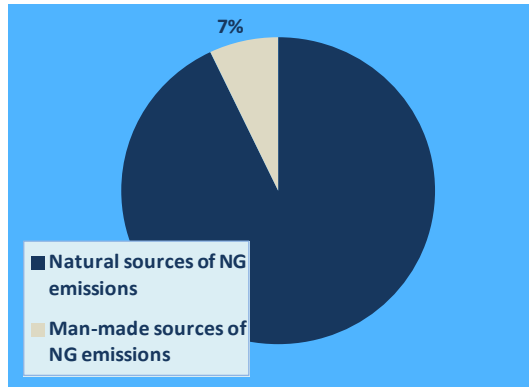


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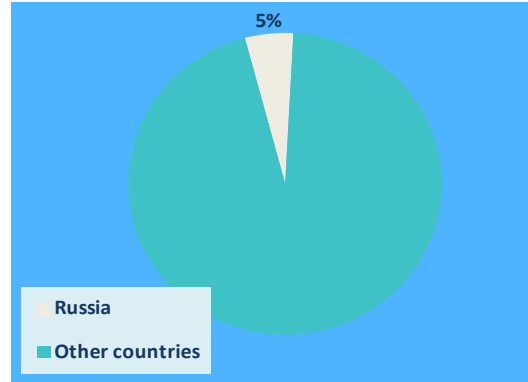


- **Introduction**
- **Target and methods**
- **Subject of the study**
- **Regulatory and technical framework**
- **Results**
- **Inventory, accounting and monitoring of GHG emissions**
- **Experience in development of GHG emission inventory**
- **Corporate GHG emission management system in the gas industry of Russia**
- **Implementation of the best available technologies: experience of Gazprom**

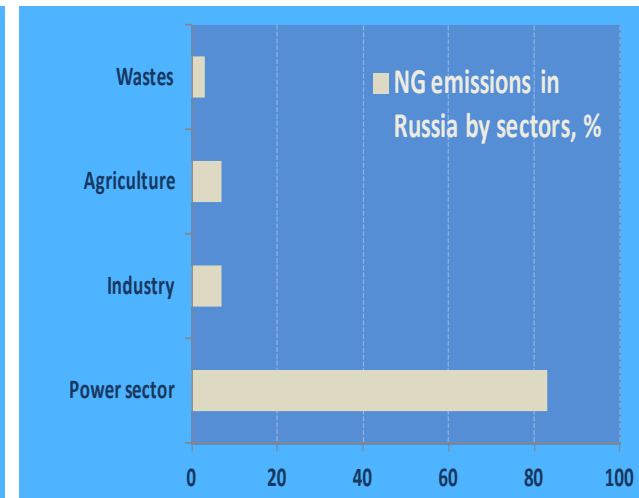
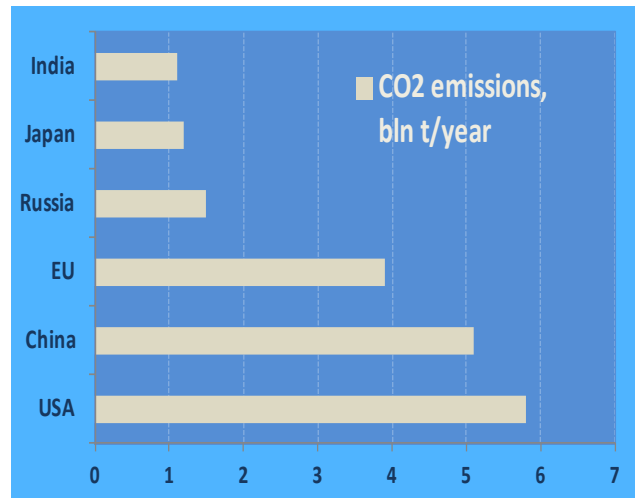
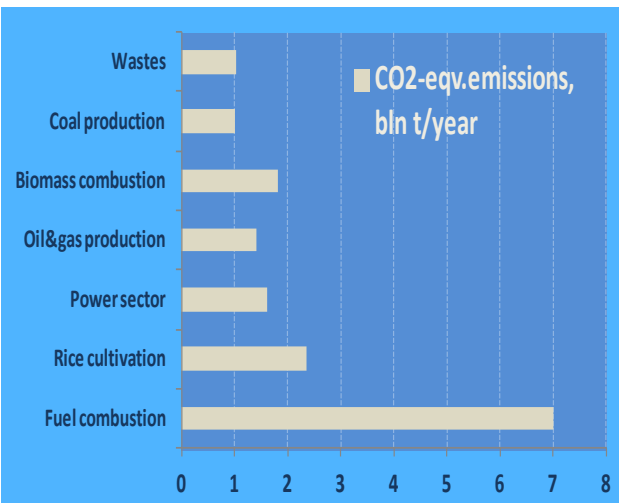
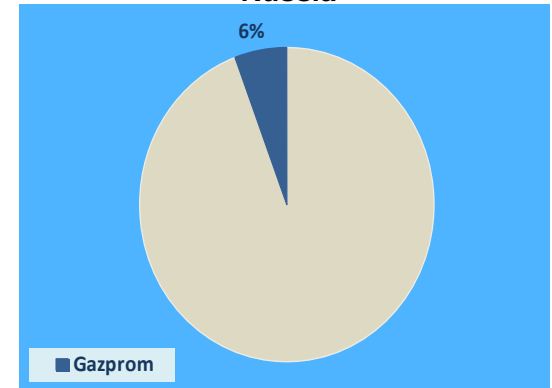
GHG emissions in the climatic system



Global anthropogenic GHG emissions



Anthropogenic GHG emissions of Russia

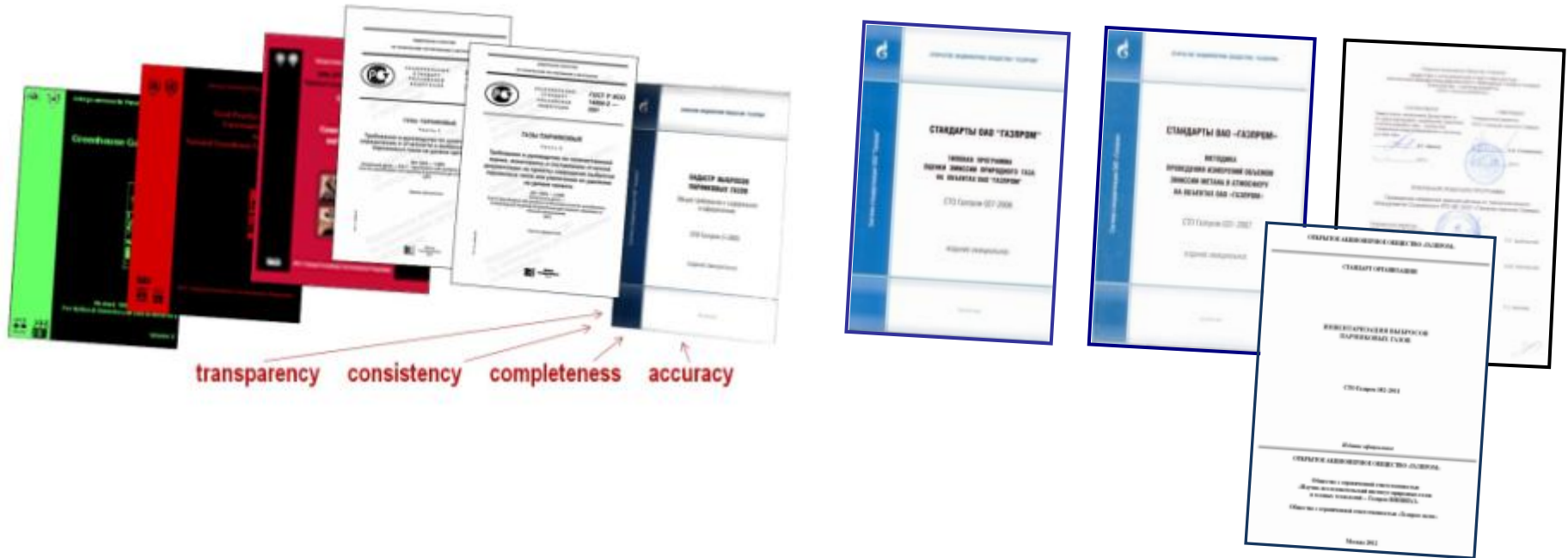




- **Drivers and impetus:**
  - *Resource saving and production energy efficiency improve*
  - *International commitments of Russian on stabilization and mitigation of greenhouse gas emissions*
  - *Corporate and foreign partners' interest in implementation of greenhouse gas emissions reduction projects*
- **Study Scope:**
  - *Design of assessment system for greenhouse gas emissions, including methane*
  - *Development of normative framework, accounting and monitoring methodology for greenhouse gas emissions, including methane and methane losses*
  - *Development and implementation of technical solutions of methane emissions reduction*
  - *Support of optimal management decisions on methane emissions control in the Gazprom system*
- **Methods**
  - *Calculative, statistical, analytical and programming methods.*
  - *Design of the corporate greenhouse gas emissions management system is based on the following international requirements: transparency, consistency, completeness, accuracy.*

Gazprom has endorsed over 10 guiding documents for GHG emissions handling, methane emissions measurement studies, inventory, accounting and monitoring of GHG emissions as well as development of energy and environmental projects aimed at reduction of these emissions.

Documents imply several implementation stages: information measurement grid and information management subsystem, which is aimed at collecting, processing, accumulation and distribution of the information.



Respective content of CO<sub>2</sub> and CH<sub>4</sub> in absolute values

CH<sub>4</sub> – 3%

CO<sub>2</sub> – 97%

Emissions Year in MMt CO <sub>2</sub> equiv.*	2005 Base year	2008	2009	2010	2011	2015 Target
<b>Methane</b>						
Transmission	86	85	56	48	40	36
Production	2	6	3	2	2	2
Storage	3	1	1	1	1	1
Gas processing	0	0,003	0,003	1	0,04	0,04
<b>Total</b>	<b>91</b>	<b>93</b>	<b>60</b>	<b>52</b>	<b>43</b>	<b>39</b>
<b>Carbon Dioxide</b>						
Transmission	79	78	55	69	75	77
Production	12	13	9	12	12	14
Storage	1	1	0,4	1	1	1
Gas processing	7	3	6,6	3	3	4
<b>Total</b>	<b>99</b>	<b>95</b>	<b>71</b>	<b>85</b>	<b>91</b>	<b>96</b>
<b>Overall</b>	<b>190</b>	<b>188</b>	<b>131</b>	<b>137</b>	<b>133</b>	<b>135</b>
Natural Gas Production, Bcm	539	518	425	465	513	550

\* CH<sub>4</sub> with calculation factor 21 to CO<sub>2</sub> equiv.



The Gazprom largest gas producer Gazprom dobycha Yamburg operates in the Arctic zone of the West Siberia, where the nature is highly vulnerable to industrial impact. The Company realizes its full responsibility for the broad range of its activities, and that is why it pays much attention to environmental problems, including GHG emissions and climate change.



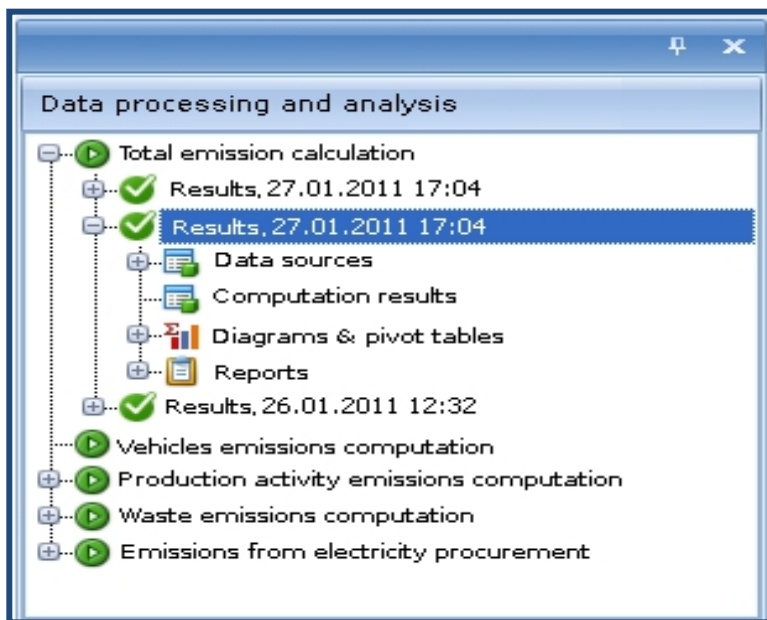


Pilot project on GHG emission inventory and software have been developed, which includes analytical information system of GHG emission accounting that automatically draws up all necessary reports.

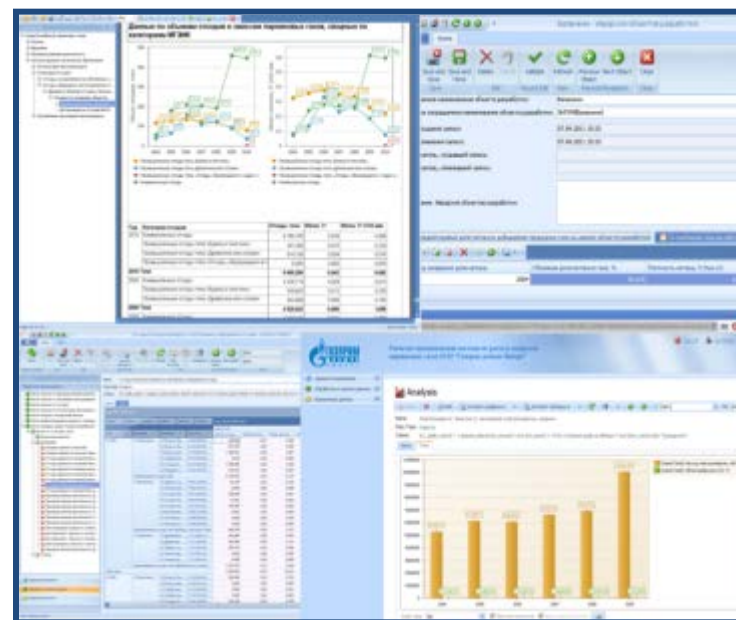
GHG emission inventory has been developed with the use of framework technology. Functionally it consists of the emissions inventory itself, emissions calculation module, and reporting module. Innovative information technologies were used for development of this software:

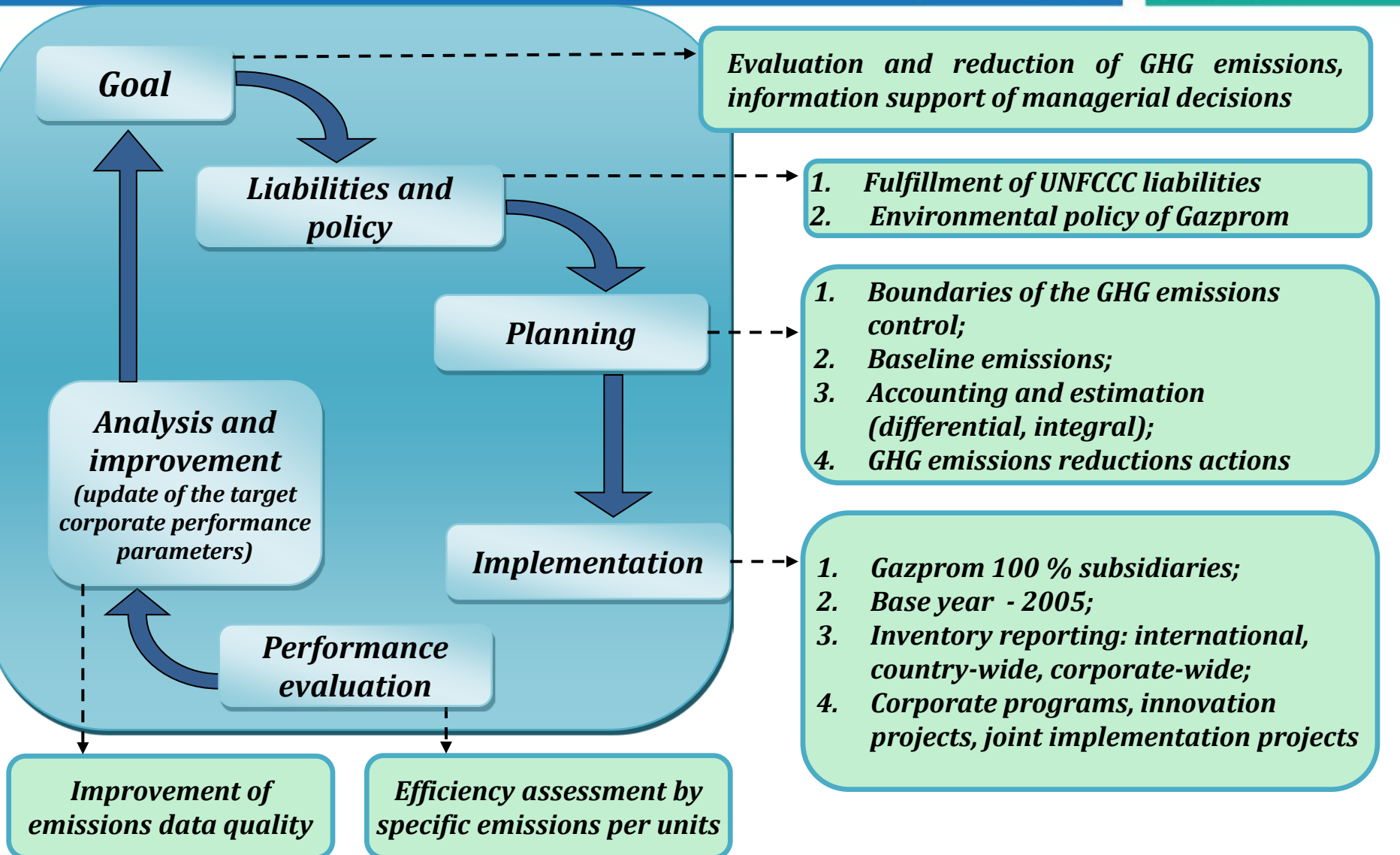
- independence from applied database management system;
- use of development framework with a possibility of creation of web-interface and desktop interface with one code;
- use of reserved ("sleeping") record technology.

## Use of sleeping record technology



## Work with diagrams

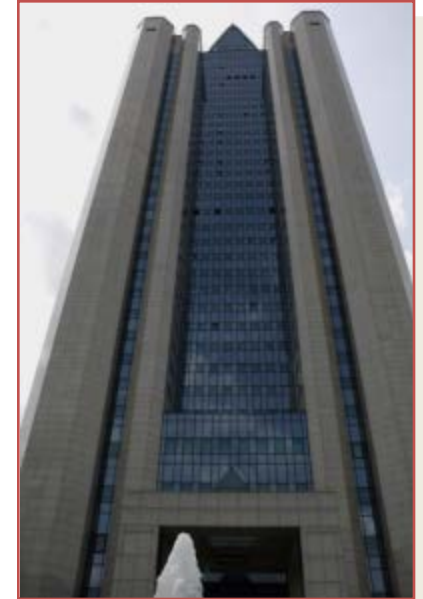




- GHG emissions reduction is associated with resource saving and energy efficiency improve.
- The company has developed the Concept and Program of Energy saving and Energy Efficiency Improve through 2020, which provide for a significant GHG emissions reduction.

The Program foresees:

- 11.4% reduction of natural gas per unit of own needs and losses.
- 9.75% reduction of GHG emissions per unit in CO<sub>2</sub>-eq.



What technologies does Gazprom apply?



- Optimization of technological regime system
  
- Gas turbine efficiency up to 40%
- Waste heat recovery
- Electrical or pneumatic start-up systems for gas turbines
- Modern seals
  
- Design and use of mobile compressors
- Implementation of hot tapping technology
- Design of energy saving equipment for up to 11.8 MPa pressure pipelines
  
- Repair and maintenance schedule update
- Modern equipment and training for operators to detect and measure leakages
- Use of remote control detection and measurement equipment (laser, IR)

- Exploration and Production
  - Research for improving well technologies
  - Modernization of process equipment
  - Gas extraction, transport and storage in forms of gas hydrates
  
- Distribution
  - Use of turbo expanders at gas distribution stations
  - Consequent regular inspection and maintenance
  - Prioritizing the leakage removal based on methane leakage rate

## Seals of compressors

- Shall create a barrier between compressor interior and atmosphere
- Historical development of 3 main types:
  1. Wet: Floating seals with oil
  2. Wet: Oil lubricated mechanical seals
  3. Dry: Gas lubricated mechanical seals
- Rating of types depends on weighting of:
  - emissions of natural gas,
  - Reliability, maintenance,
  - investment and operating costs etc.
- New ones: Today manufacturers are focused on dry seals
- Existing ones: Equipped with seals available at that time
- In cases of retrofitting:
  - Old floating seals: By keeping the oil system, reconsider change to oil lubricated mechanical seals providing less emissions of natural gas.
  - In general check the use of (otherwise emitted) natural gas in
    - other combustion installations, e.g. in an existing CHP or
    - recycle.

## Recommendation

- Reconsider oil lubricated mechanical seals for new compressors



- Regular\* inspection and leakage detection to know emission sources and their level
- Repair and maintenance of leaking equipment in relation to emission level
- Technology for detection is developing rapidly, use of modern equipment
- Equipment must be used by trained and experienced personnel:
  - Helicopter-based survey with laser or similar technology (e.g. CHARM<sup>®</sup>) on high-pressure pipelines
  - Car-based or manual survey on distribution grid
  - Mobile detection camera for compressor stations (e.g. Gascam<sup>®</sup>) or manual detection with methane detectors

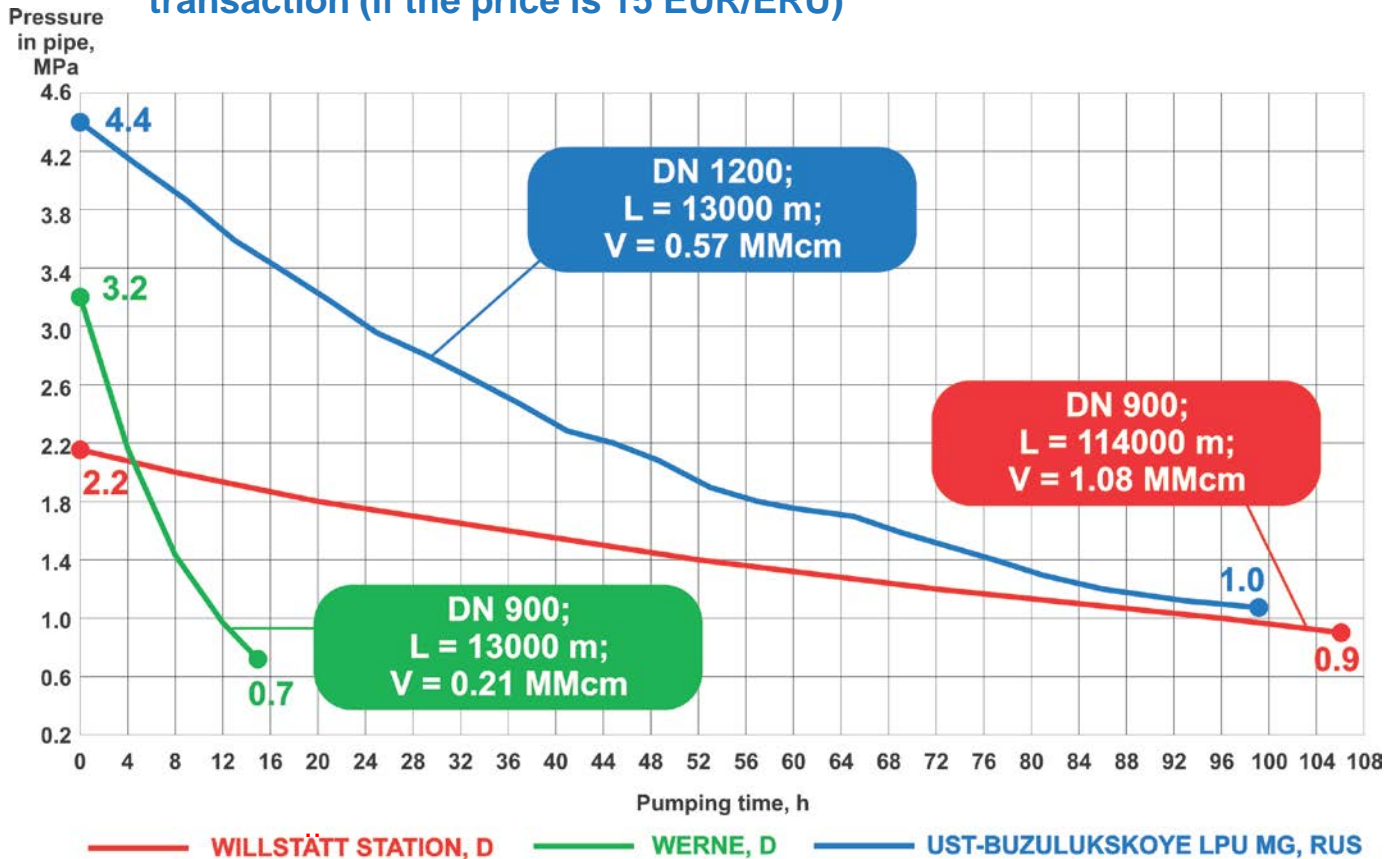


\* Adequate to experiences (e.g. failure probability, level of emissions etc.)

Purchase of 9 MCS till 2011, 3 stations each year. The projects enables an annual GHG emissions reduction of 1.5 billion m<sup>3</sup> of gas (21 MMtCO<sub>2</sub>-eq). The profit from the saved gas sales is 100 million EUR (if the price is 70 EUR/1000 m<sup>3</sup>) and 300 million EUR from the emissions reduction units transaction (if the price is 15 EUR/ERU)



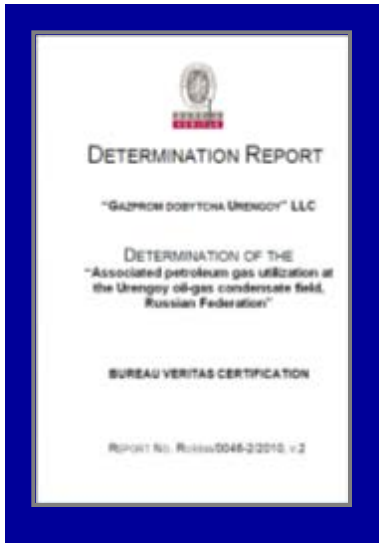
November 2010: qualification test of a Russian made mobile compressor station on the Ust Buzuluksk linear pipeline section of Gazprom transgaz Volgograd



**Project target** – efficient use of natural gas and greenhouse gas emissions reduction by means of utilization of low-pressure associated petroleum gas (APG) for energy generation

For this purpose the project envisages the construction of two compressor plants (CS № 1 and CS № 2) at the Urengoy oil-gas condensate field, which enabled:

- reduction of APG flaring;
- reduction of pollutant emissions, including greenhouse gases;
- use of gas, which was previously flared at CPF-1,2 during compressing for own needs into the system of gas lift NP-1,2 (major part) and for the consumer (remainings).



- As a result the APG utilization will make:
- 2.2 billion m<sup>3</sup> till 2012
  - 7.8 billion<sup>3</sup> from 2013 till 2020



- **Gazprom and Rurgas has significant potential to reduce GHG emissions to achieve in parallel**
  - positive economic development and
  - environmental benefits.
  
- **Optimize technologies:**
  - Reduce of natural gas emissions (e.g. by mobile compressors)
  - Improve energy efficiency (e.g. with modern gas turbines)
  
- **Optimize management:**
  - Optimize of the operation of gas transmission system (e.g. with software support)
  - Implement corporate system of GHG emissions management
  
- **Corporate target: Reduce GHG emissions by 40% until 2015 compared to 2005.**



**Thank you for your attention!**