Reduction of methane emissions: Russian case studies

Dr. Konstantin Romanov
Executive secretary of Gazprom Coordinating committee on environmental protection and energy efficiency,
Head of Division

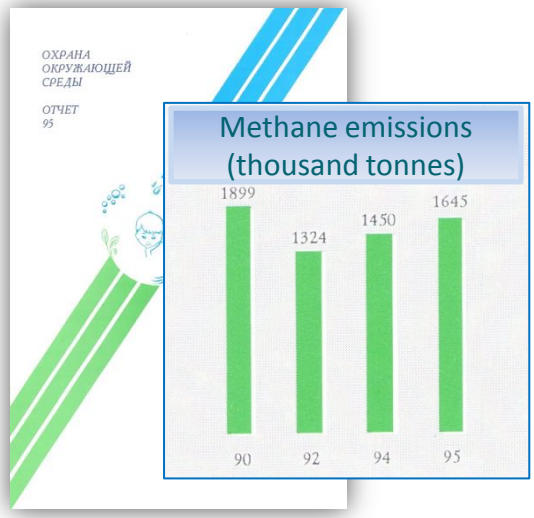
METHANE EMISSIONS REGULATION IN RUSSIA

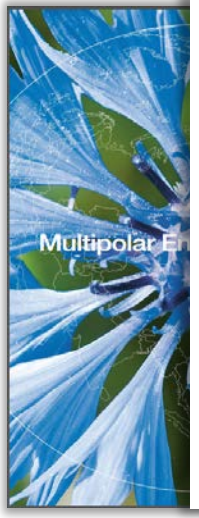
Toxic Gas

Greenhouse Gas

FEE → KPI →

Corporate environmental target:
methane emissions reduction

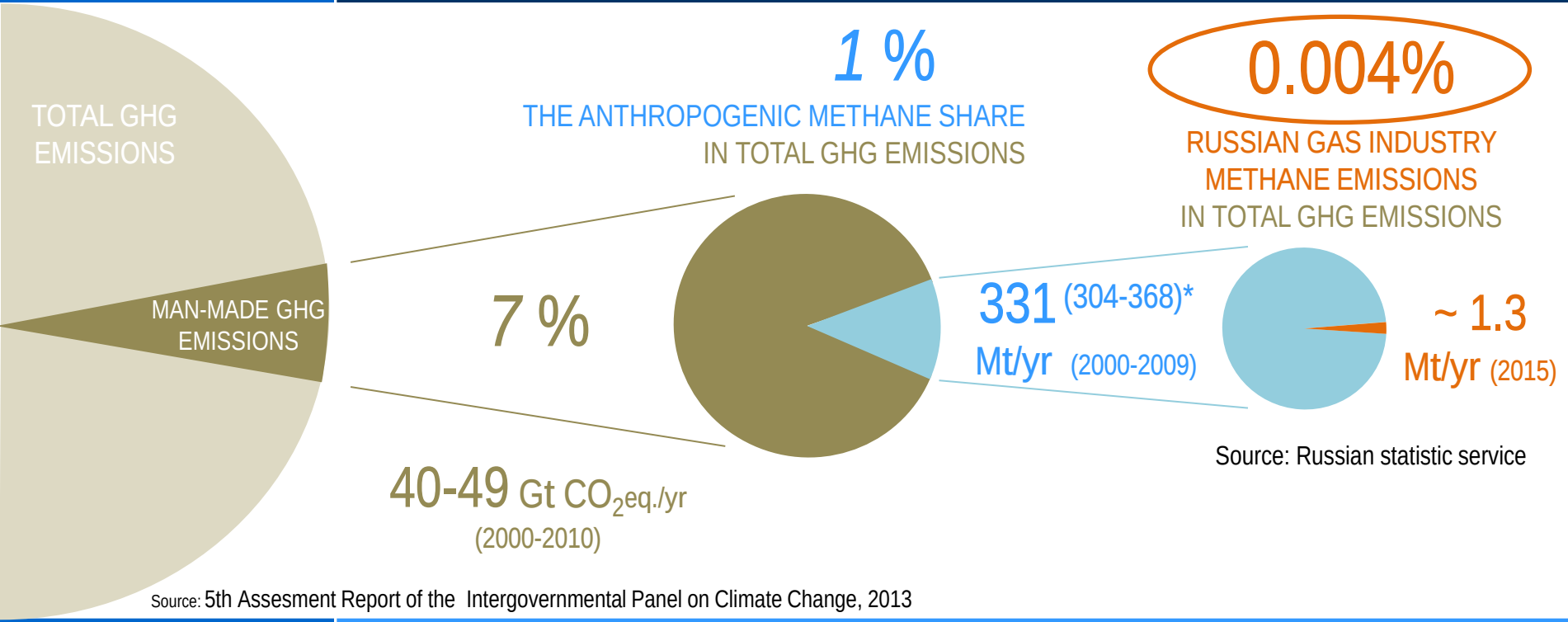




Dynamics of air pollutant emissions from the PJSC Gazprom stationary sources, 2011–2015, kilotonnes

	Total emissions	Including methane	Including methane vented for repair services
2011	2,162.00	1,420.60	1,050.70
2012	2,131.03	1,436.85	1,062.60
2013	2,151.69	1,447.05	1,076.70
2014	1,832.67	1,258.77	957.89
2015	1,836.43	1,297.21	995.54

GAS INDUSTRY SHARE IN TOTAL GHG EMISSIONS



Source: Russian statistic service

Source: 5th Assesment Report of the Intergovernmental Panel on Climate Change, 2013

FOCUS AREA OF METHANE EMISSIONS REDUCTION

Reduction of GHG emissions from fuel

- Reduction of fuel combustion by optimizing GCU operation and main gas pipeline systems
- Reduction of fuel combustion by equipment modernization and technologies optimization
- Improving environmental characteristics GCU

Reductions of methane emissions during technological operations

- Gas venting reduction by improving procedures
- Reducing methane venting through the innovative technologies application of methane substituting (nitrogen, electrostart, pneumostart, gas-oil heat exchangers)

Reduction of methane emissions during equipment repairing

- Reducing of methane venting during CS and main gas pipeline equipment repair through:
  - gas generation, gas bypass
  - hot tapping technology under pressure, reinforced coupling
  - use of mobile compressor unit (MCU)

Control of leaks and its elimination

- Control of methane leaks:
  - regular helicopter overflights of the linear part of main gas pipelines
  - regular instrumental inspection-screening of equipment
- Elimination of leaks

TECHNOLOGIES FOR METHANE EMISSIONS' REDUCTION DURING TECHNOLOGICAL OPERATIONS

GROUP GAS DYNAMIC ANALYSIS OF WELLS CLUSTER

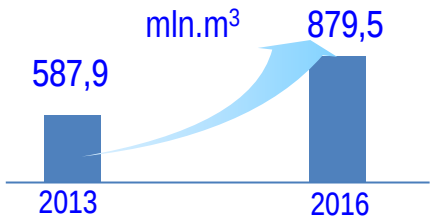
- Gas venting to the atmosphere is eliminated
- Total well production is kept constant during the testing
- The interference of wells in cluster within one flowline is taken into consideration
- All testing gas is delivered to the consumers
- "On-line" well control on the different production rate

Prevention of methane emissions (for 5 years)	
Gas utilization during well repairing and inspection	2088.1 mln m^3
Reduction of methane losses from equipments (electrostart, pneumostart, gas-oil heat exchangers)	1721.6 mln m^3

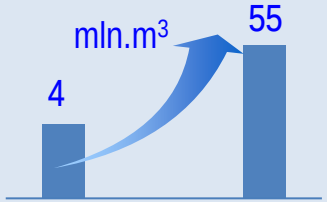
TECHNOLOGIES FOR METHANE EMISSIONS' REDUCTION DURING EQUIPMENT REPAIRING

Since 2014 the corporate program of gas conservation during precaution and repairing activities has been realized in Gazprom

Prevention of gas venting during repairing



including input of mobile compression units



According to R&D program a mobile compressor unit is developed and applied in "Gazprom transgas Kazan" (capacity - 60 thous. m3 /hour)

including input of hot tapping technology under pressure

2014	123.**27 млн. м**3
2015	236.73 **млн. м**3
2016	94.**37 млн. м**3

METHANE EMISSIONS DETECTION, MEASUREMENT AND ELIMINATION

Distant periodic monitoring of methane emissions with total quantitative assessment by laser gas sensor

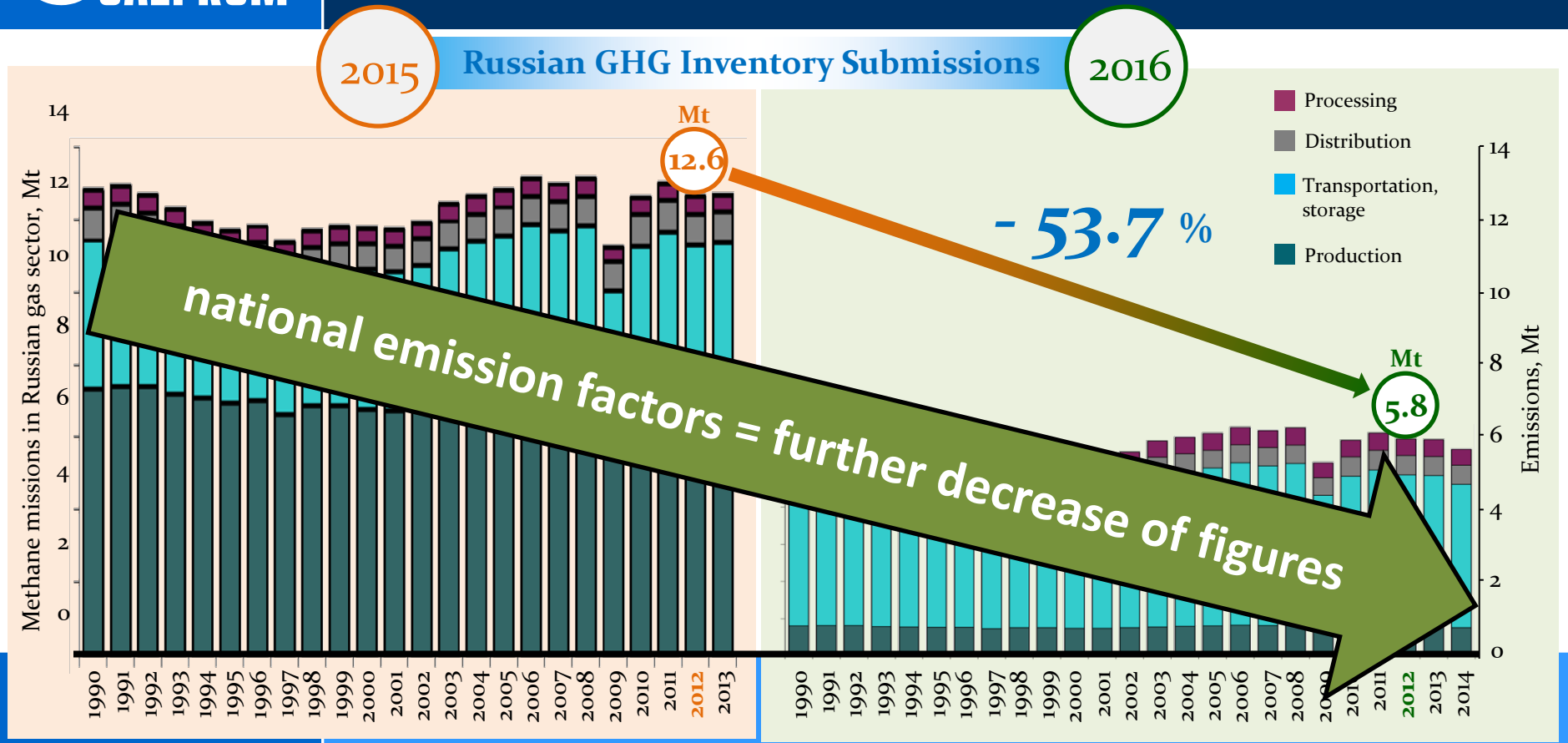
Periodic monitoring of natural gas emissions on compressor stations by hand-held control devices

DETECTOPAK-INFRARED (DP-IR)

Continuous monitoring of natural gas concentration on compressor stations by laser technologies

- Detector of threshold concentration
- Video of scanning sector
- Time plot of concentration

EMISSIONS FACTORS IN NATIONAL INVENTORIES



ISOTOPIC EVIDENCE

Modern methods of determining the age and the source of methane (CH_4) are based on the registration of stable isotopes carbon-12 and carbon-13 and its natural ratio 98.92% and 1.08%.

Siberian gas fields have isotope ratio, which is after dilution in regional air masses would be unlikely to produce the shift observed

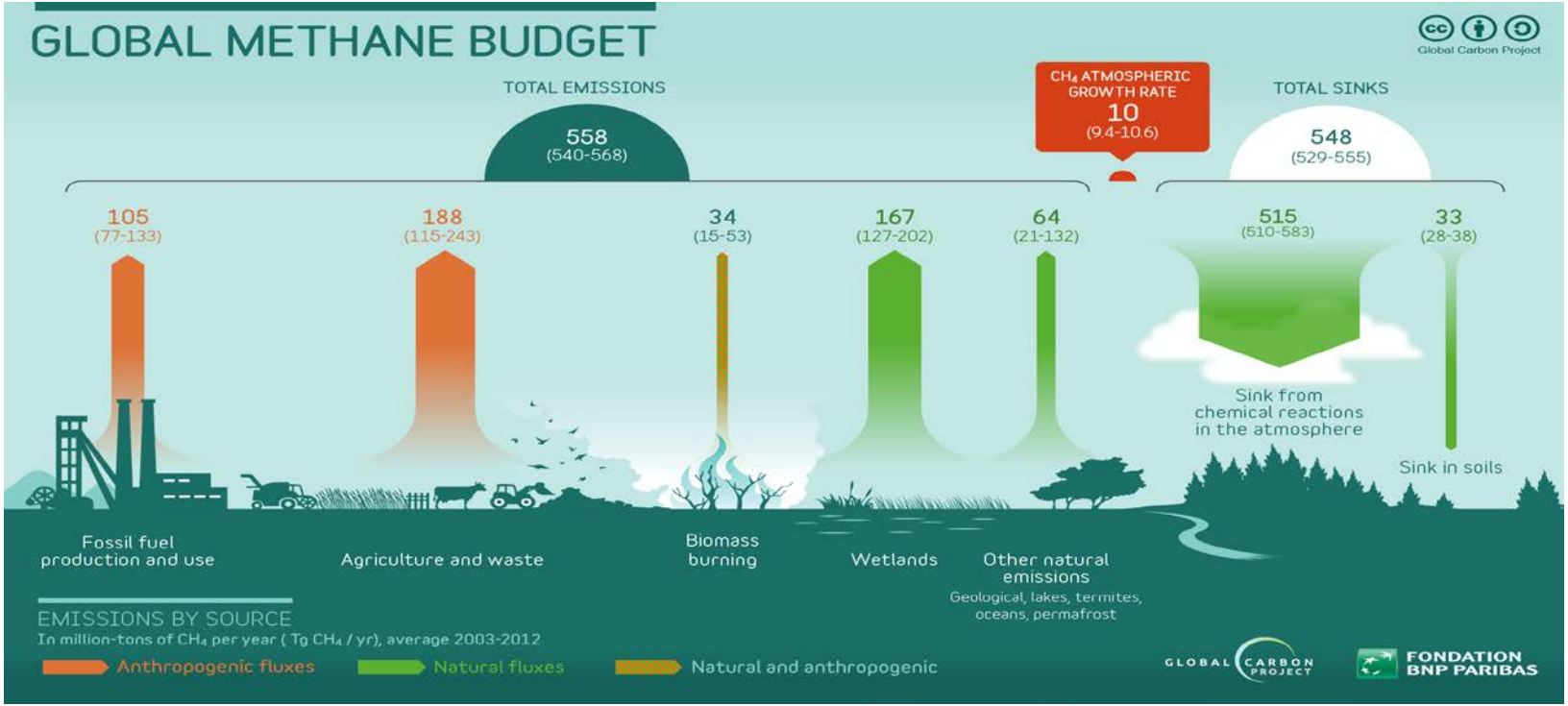
→ Russian natural gas is not the source of methane growth in the atmosphere

Isotopic studies indicate that the methane rise is a result of **increased emissions from biogenic sources**, e.g., extension of wetland and expansion in the number of methane emissions sources in agriculture: ruminants and rice fields

https://www.repository.cam.ac.uk/bitstream/handle/1810/261156/Nisbet_et_al-2016-Global_Biogeochemical_Cycles-VoR.pdf?sequence=1&isAllowed=y

Taking samples: US National Oceanic and Atmospheric Administration (NOAA)
Isotopic analysis: Institute of Arctic and Alpine Research, Royal Holloway, University of London, University of Heidelberg

GLOBAL METHANE BUDGET (2003-2012)



http://www.globalcarbonproject.org/methanebudget

NO SINGLE METRIC CAN ACCURATELY COMPARE ALL CONSEQUENCES OF DIFFERENT EMISSIONS, AND ALL HAVE LIMITATIONS AND UNCERTAINTIES**

Global Warming Potential (GWP)

on the cumulative radiative forcing over a particular time horizon

Up to 4th IPCC report , the most common metric has been the Global Warming Potential (GWP)

The uncertainty in the GWP increases with time horizon, and for the 100-year GWP of well-mixed greenhouse gases the uncertainty can be as large as ±40%

Several studies also point out that GWP is not well suited for policies with a maximum temperature target" - like in Paris agreement

BASED ON

Global Temperature Change Potential (GTP)

the change in global mean surface temperature at a chosen point in time

There is now increasing focus on the Global Temperature Change Potential

The GTP metric is better suited to target-based policies

25 * ← values for fossil methane for 100 years → **6**

*(28 ** or 34 with ccf***)* *(13 with ccf***)*

Source: Fifth Assessment Report of the IPCC (2013)

* 4 Assessment IPCC Report ; ** 5 Assessment IPCC Report ; *** carbon-climate feedback

IBC PROJECT
“METHANE’S ROLE IN THE CLIMATE CHANGE”

International Business Congress

An appropriate estimation of the methane’s role in climate change is crucial for making scientifically proven political decisions considering the Paris Climate Agreement

TARGET

To analyze of methane’s role in climate change considering different metric indexes in scientific studies and to provide recommendations to experts and decision-makers

RESULTS

Publication of the analytical report in English and Russian (May 2018)

Contact of the project operator: info@niipe.com

GAZPROM

2017 GREEN YEAR
CONSERVING NATURE

V INTERNATIONAL CONFERENCE

“ENVIRONMENTAL SAFETY IN THE GAS INDUSTRY”

Moscow, December 5-6, 2017

contact: M_Plotnikova@vniigaz.gazprom.ru