GAZPROM
VNIIGAZ

Advantage and Hazard to the Environment from Construction and Operation of Underground Gas Storage Facilities

Dr. Nadezhda Vlasenko, Dr. Sergei Khan,
Dr. Artyom Arutyunov, Dr. Gretta Akopova
VNIIGAZ, GAZPOM, RUSSIA

23rd World Gas Conference
Amsterdam, 5-9 June, 2006

Objective:

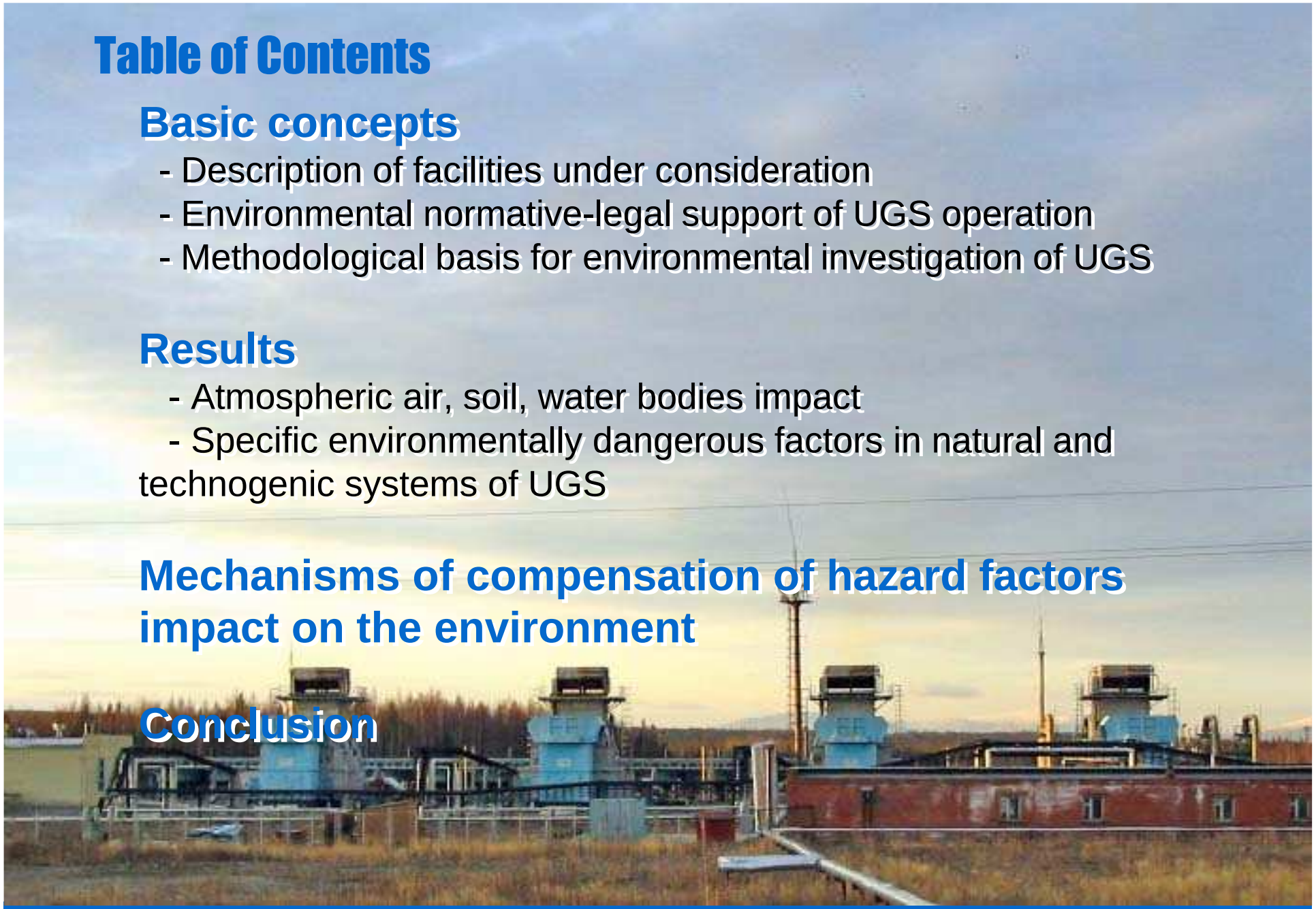
- the creation of methodological basis for detection, assessment and lowering the negative impact on the environment and provision of the UGS environmental stability;
- systematization of positive and negative factors at stages of UGS construction and operation

Tasks:

- study and evaluation of the conditions of natural and technogenic systems of UGS-located regions

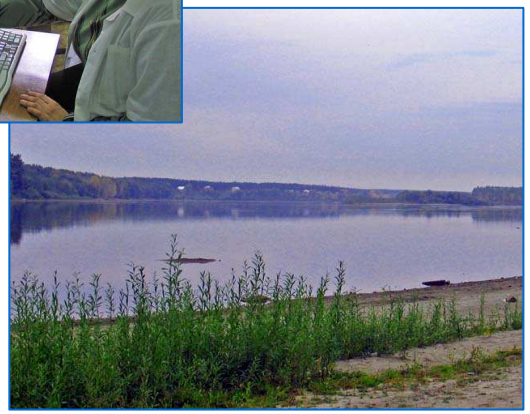
- development of technical solutions and recommendations on contaminant factors localization or elimination

Table of Contents



Methods and means of environmental monitoring of the UGS facilities' natural-anthropogenic systems:

- field surveys;
- laboratory chemical analytical work with the use of modern analysis technique and precise equipment;
- data analysis and assessment;
- compiling of database for interaction with the elements of vertically integrated system of environmental monitoring



Objects of study:

major basic UGS facilities of the Unified Gas Supply System, constructed in aquifers and depleted fields

Sources of hazard environmental emissions

Construction and operation of UGS surface equipments

- Gas pumping units
- Compressors
- Boiler unit/Fire heater
- Flare
- Vent pipe
- Drying units
- Valves
- Separator stations
- Stock reservoir
- Building technology/ motor transport

Pollutants

Gases

- NO_x
- CO_x
- Methane

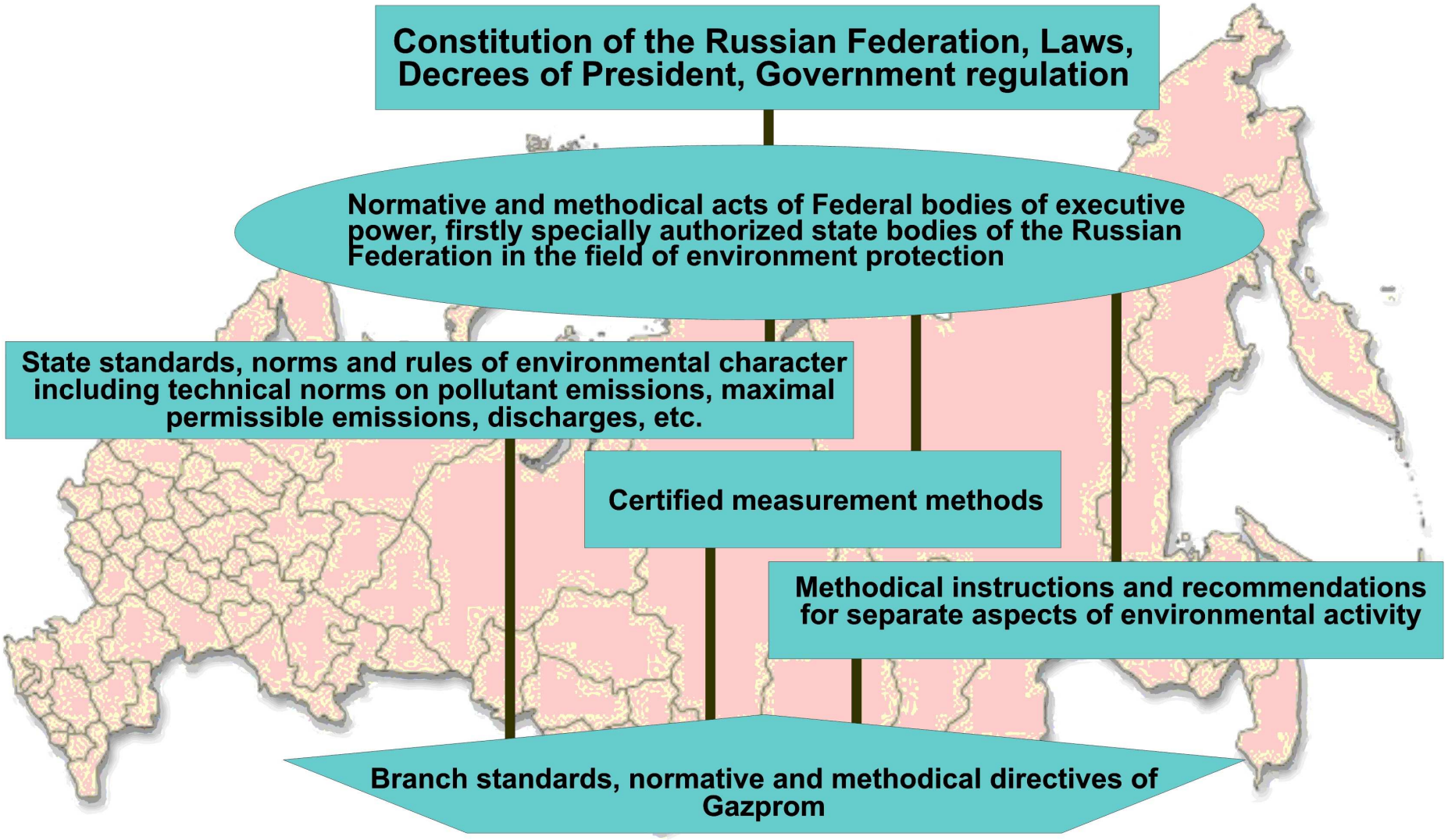
Liquids

- Methanol, Glycol
- Lubricating oil
- Hydrocarbon condensate
- Formation water

Legislative and normative environment protection basis is aimed at maintenance of:

- Stability and reliability (safety) of all systems of functioning of underground gas storages objects
- Safety of the personnel and working conditions
- Prevention of accident rate
- Technical efficiency
- Ecological stability

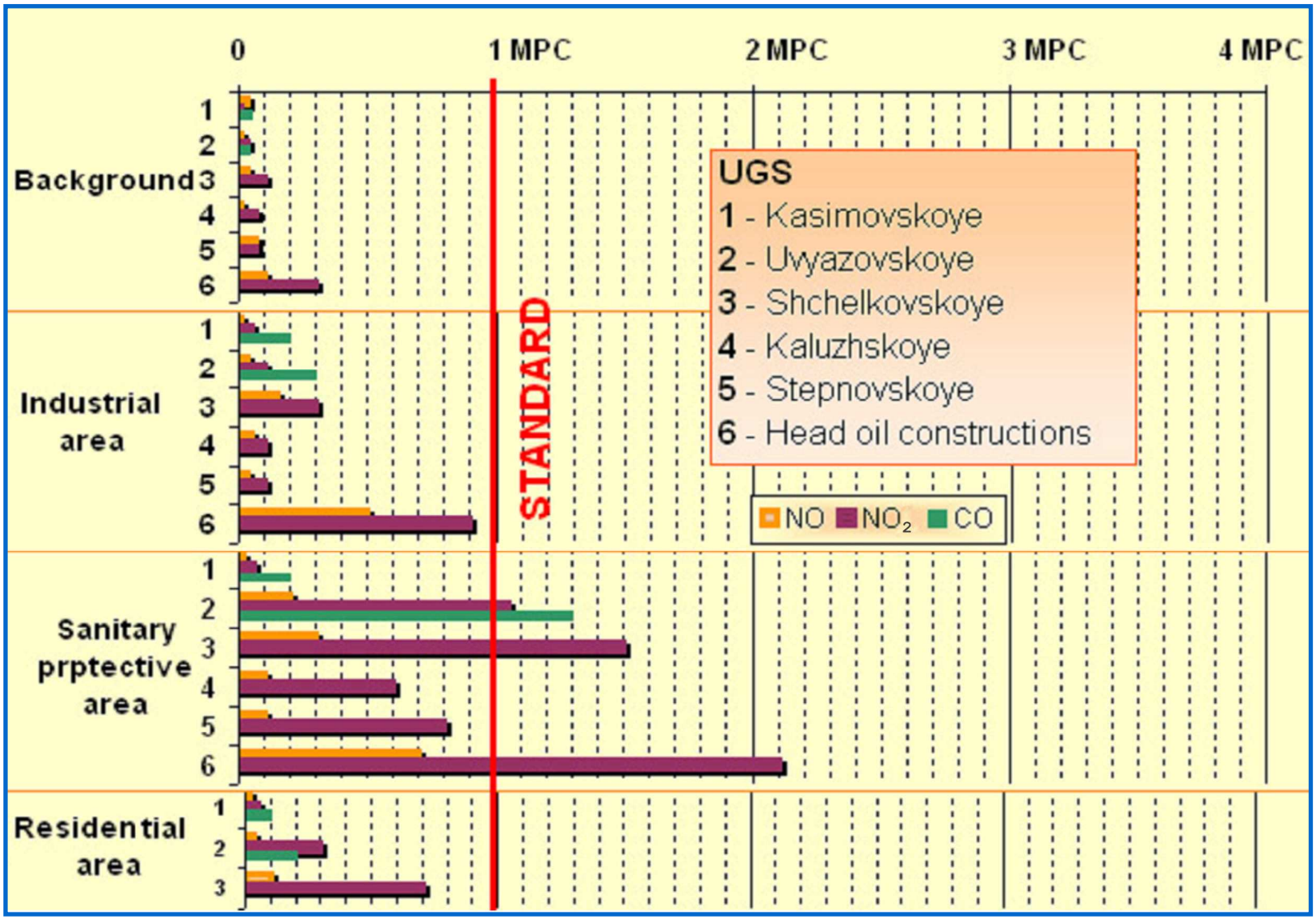
Legislative System of Gazprom's Environmental Activity



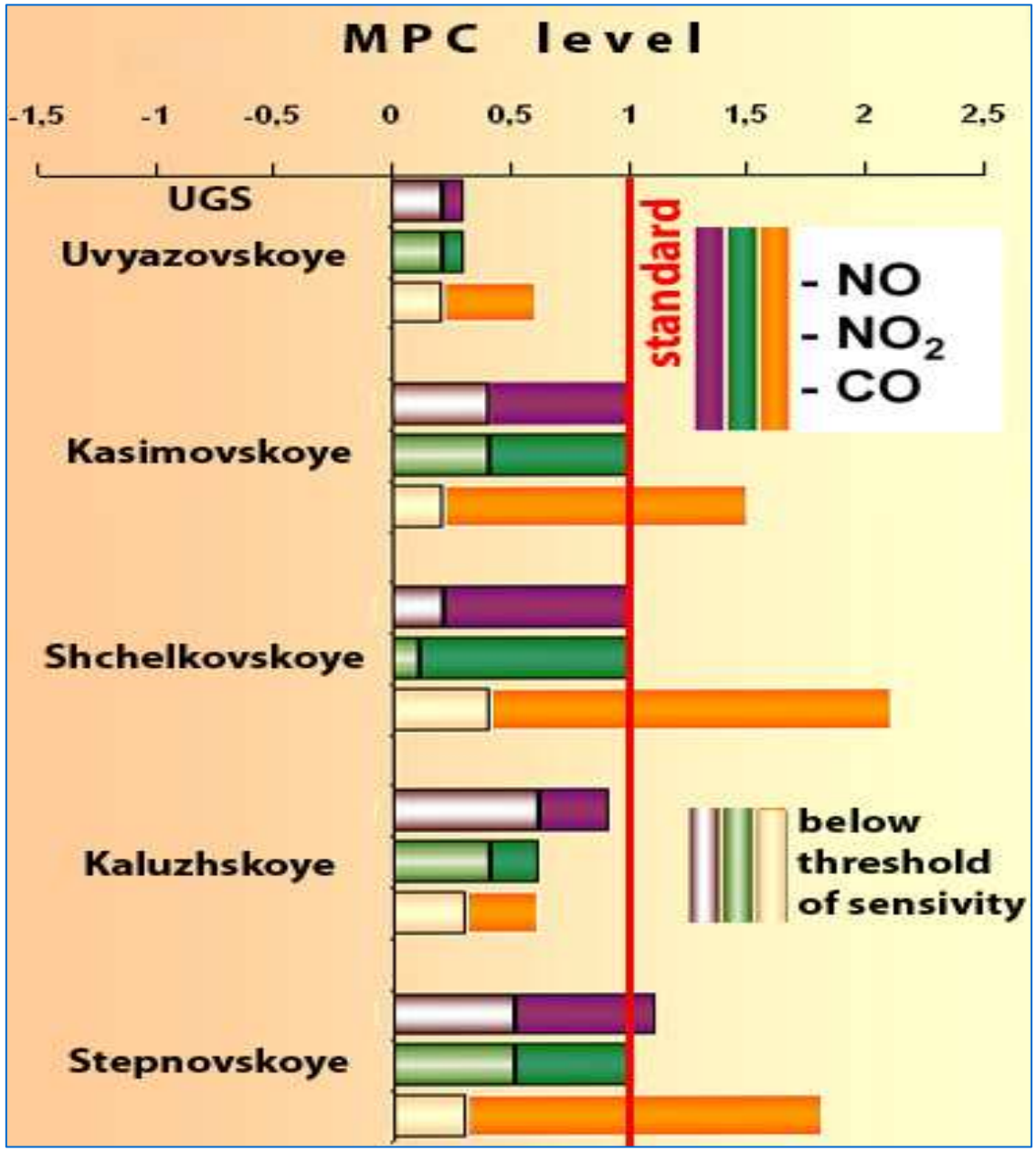
The methodological base of investigation

- Monitoring of natural-technogenic systems
- Control and measurement in territories (with a network of observation points) under monitoring: industrial, sanitary-protection zones and settlements.
- Substantiation and selection of pollution indices
- Methods and criteria of UGS environment evaluation
- Definition, development and acceptance of environmental and design options by environmental monitoring results.

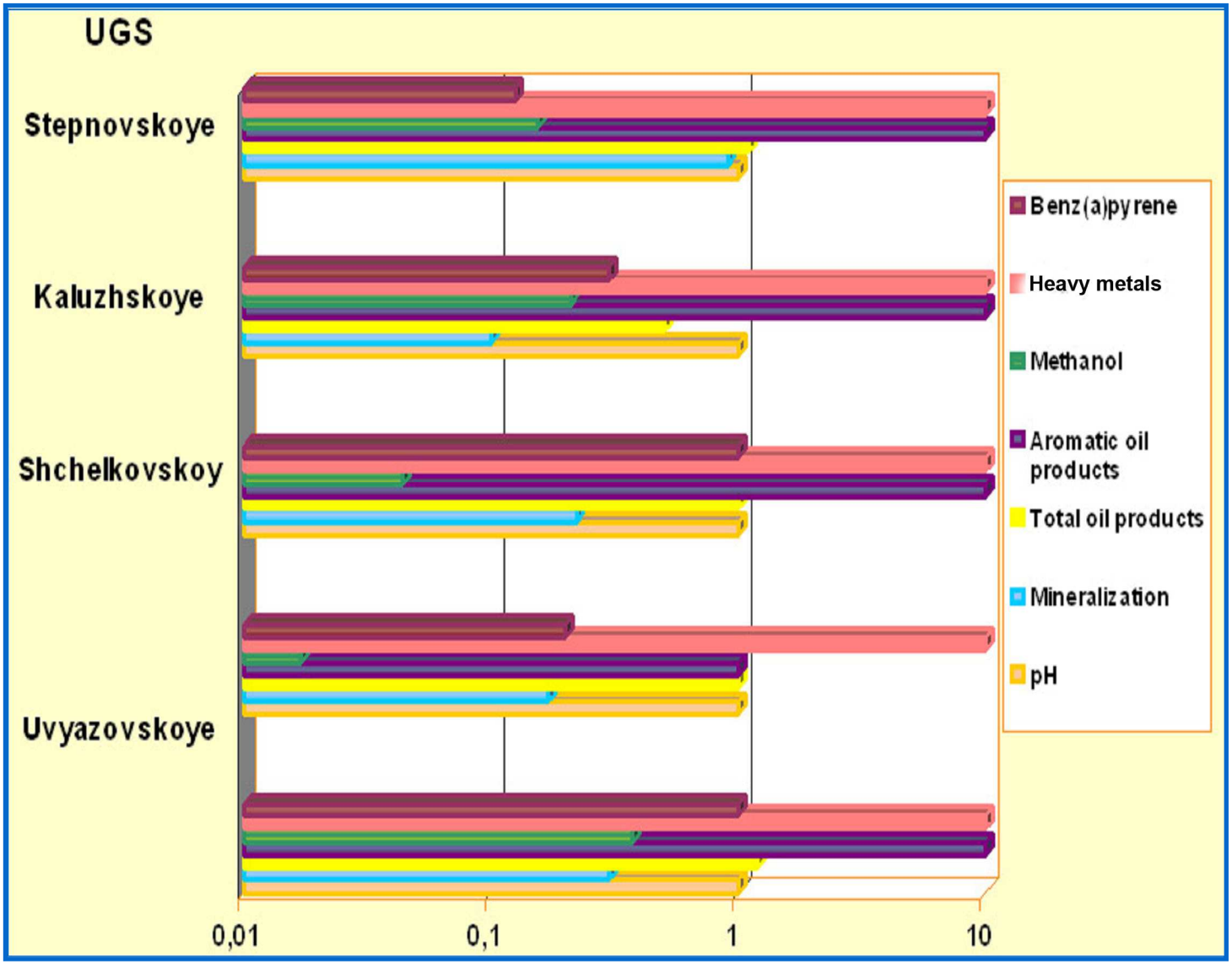
NOx and CO content in atmospheric air in UGS regions



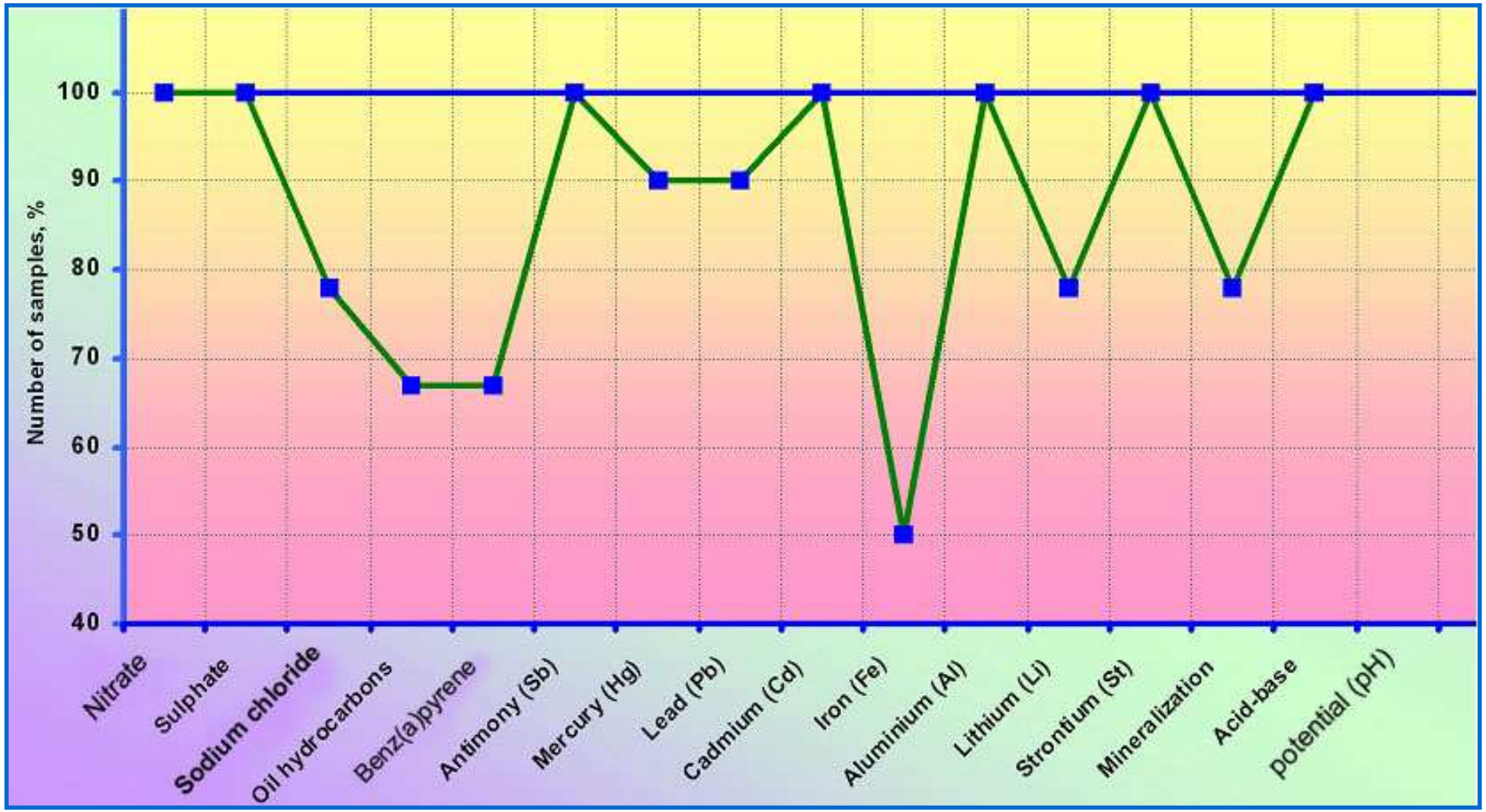
NOx and CO content in effluent gases of gas compressor units



Pollutants content in soil



Conformity of pollutant concentrations in water samples to Russian standards



Mechanisms of compensation of hazard factors impact on the environment

Payment rates for emission/disposal of pollutants

Type of impact	Matter	Payment rate for a ton (Euro)	
		Within permis-sible rates	Within limits
Emission into atmospheric air	NO2	1,53	7,66
	NO	1,03	5,16
	CO	0,01	0,08
	Methane	1,47	7,37
	Benz(a)pyrene	60466,106	302330,53
Disposal in water	Benzene	16,28	81,4
	Oil and NP	150,73	812,68
	Nitrate-ion	0,2	1,01
	Nitrite-ion	101,59	507,96

Payment rates for industrial and consumption waste disposal

Type of wastes (by class of environmental risk)	Payment rates for disposal of a ton of wastes within fixed limits, Euro)
1 class (very hazardous)	51,3
2 – « - (highly hazardous)	21,99
3 – « - (moderately hazardous)	14,66
4 – « - (low-hazardous)	7,32
5 – « - (practically are not hazardous):	
production	0,01
processing	0,43 (for 1 m^3)

Conclusion

The typical negative impact of the UGS activity on the condition of:

atmospheric air:

- exceeding norms emissions of NO_X and CO (gas pumping units);
- influence of third party;
- unfavorable meteorological conditions;

soil (local pollutions):

- waste disposal
- imperfection of technological operations
- emergency spillage of petrochemicals
- degradation in the process of UGS exploitation
- high background pollution level

water bodies:

- storage construction in salt beds;
- waste disposal;
- ingress of pollutants with rain, melted snow, underground and subsoil waters;
- dry deposition on water surface and plane washout of polluted soil cover

Conclusions

The most important positive factors providing environmental safety of UGS facilities:

- conformity of UGS operation to environmental regulations and higher social standards;
- studying of background conditions at the stage of UGS designing;
- organization of continuous environmental monitoring and control of equipment in the UGS facilities location area;
- taking of environmentally supported economic management decisions during the development of the environmental impact assessment;
- conducting of UGS reconstruction;
- planning of resource-saving and nature-conservative measures with use of accumulated environmental experience;
- scientific forecasting of expected changes

Scientific-Research Institute of Natural Gases and Gas Technologies - VNIIGAZ

internet: www.vniigaz.ru

e-mail: vniigaz@vniigaz.gazprom.ru

phone: (+7 495) 355-92-06