



**INSTITUTE OF COMPREHENSIVE EXPLOITATION OF MINERAL RESOURCES
RUSSIAN ACADEMY OF SCIENCES**

Centre for Coal Mine Methane in Russia

**Director
Corresponding-member RAS
Valerii Zakharov**

**Deputy director for science
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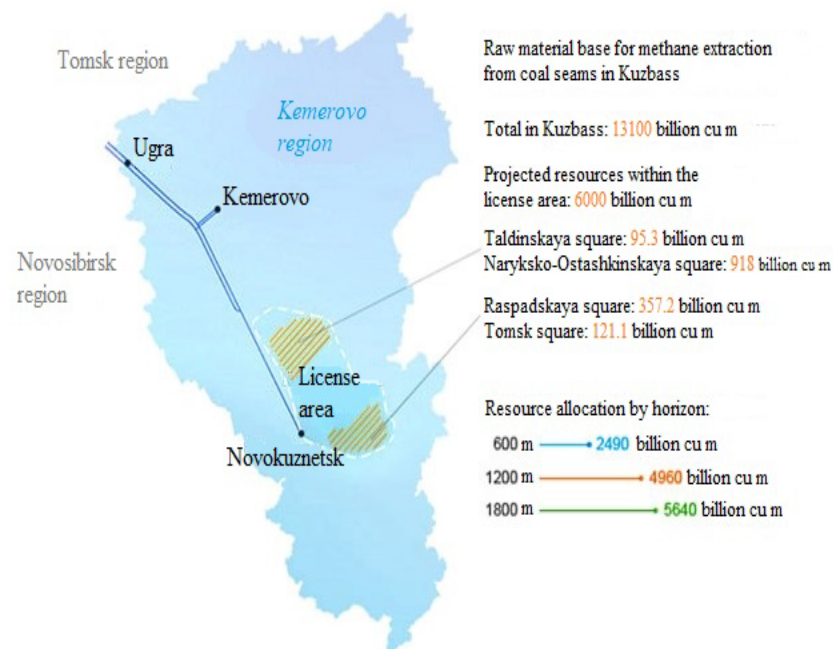
Genève, Switzerland

21st March 2022

Methane deposits in Kuzbass

The highest density of coal methane resources
Resources of the Kuzbass regions for large-scale
methane production (outside the mine fields)
as an independent mineral:

- "Yerunakovsky" - 2935.0 billion m³,
- "Tom-Usinsk" - 1403 billion m³,
- "Kondomsky" - 967.3 billion m³,
- "Tersinsky" - 956 billion m³,
- "Bunguro-Chumyshsky" - 758.9 billion m³,
- "Kemerovo" - 710.3 billion m³,



The highest density of coal methane resources (from 2.0 to 1.0 billion m³/km²) are characterized by: "Erunakovskij", "Tom'-Usinskij", "Bunguro-Chumyshskij", "Prokop'evsko-Kiselevskij", "Aralichevskij", "Kondomskij", "Mrasskij" and "Titovskij" geological and industrial areas of Kuzbass. The density of coalbed methane resources within the boundaries of the estimate to the depth of - 1500 m is on average 716 billion m³/km² in Kuzbass.

Background

INSTITUTE OF COMPREHENSIVE EXPLOITATION OF MINERAL RESOURCES RUSSIAN ACADEMY OF SCIENCES

Department "Center of problems of methane and gas-dynamic phenomena of coal and ore deposits"

Lab. 2.1 Physico-chemical and thermodynamic processes in rocks

Lab. 2.2 Geodynamic and gas-dynamic processes in the development of coal and ore deposits

Lab. 2.3 Geotechnological risks in the development of gas-bearing coal and ore deposits



Permanent employees - 26



Temporary employees - up to 25

2018-2022
Projects

33

Main purposes and objectives

Non-profit partnership

"Center for research of best practices in the extraction and use of coal mine methane "

- Research and development for increasing the extraction of coal mine methane by degassing at all stages of the life cycle of a coal-methane field - before the opening of the field, during its industrial extraction, after the completion of the field development;
- Development of methods and tools for extracting methane-conditioned gas-air mixtures suitable for utilization, including in gas-piston / gas-turbine engine installations that generate electric and thermal energy for the needs of mining enterprises;
- Development of methods and tools for increasing the use of methane captured in mines in the regional industry and housing;
- Creating conditions for reducing the amount of coal methane released into the atmosphere;
- Development of methods and means for cleaning CMM, extracting methane from it and producing LNG or compressed methane as a commercial product;
- Research and organizational activities for forming a new resource-producing industry of the Russian Federation.

Research and development activities

- Analysis and research of CMM deposits;
- Creating a map of CMM deposits of the Russian Federation;
- Creation of a digital models of a coal-methane deposit;
- Development of domestic technical tools of CMM extraction;
- Development of methods and tools for intensifying the extraction of CMM;
- Development and feasibility study of the technology of CMM;
- Development of technical tools for processing CMM into LNG and compressed methane;
- Development of technical tools for the use of LNG.

Production and industrial activities

- Creation of a pilot landfill (technical complex) for experimental and industrial development of CMM extraction technologies, intensification of CMM extraction and processing processes;
- Creation of a pilot plant of CMM and the production of LNG;
- Creation of technical tools for accounting, storage and transportation of LNG;
- Creation and / or adaptation of technical tools for the production of electric and thermal energy using CMM as fuel;
- Creation of a pilot complex of motor vehicles (quarry transport) using LNG as fuel;
- Working out the principles of using LNG/compressed CMM in housing.

Structure and functioning

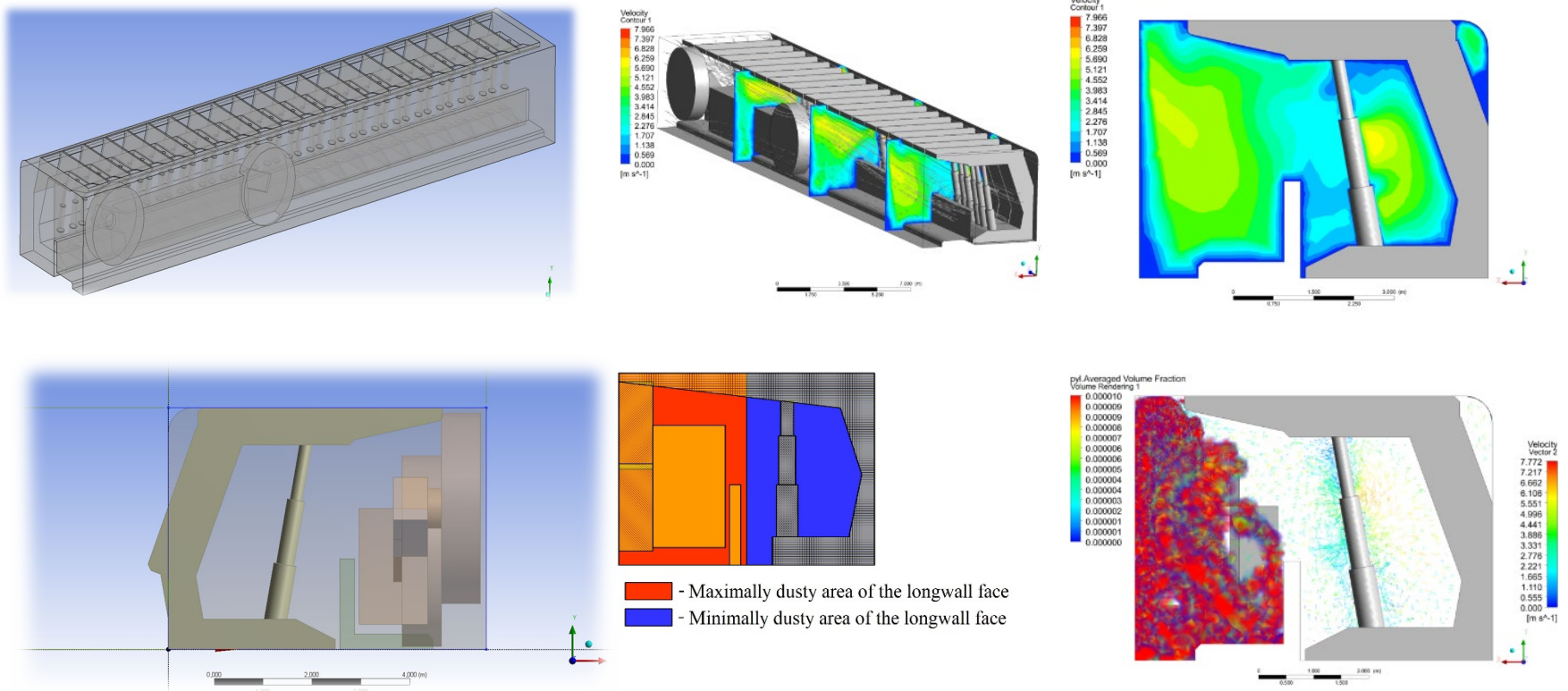
Non-profit partnership "Center for research of best practices in the extraction and use of coal mine methane "

- "Center for research of best practices in the extraction and use of coal mine methane" is Non-profit partnership of:
 - ICEMR RAS
 - JSC «SUEK»
 - EVRAZ
 - Gazprom Dobycha Kuznetsk, LLC
 - National University of Science and Technology MISIS;
 - JSC "NC VostNII"
- The center's activities are carried out in accordance with the Strategic Research Plan, State Tasks and Projects, Programs of the Russian Academy of Sciences, Charters of the founding organizations, orders and instructions of the Director of the NP.
- The center carries out domestic and international scientific-technical cooperation with all types of organizations, ministries and departments, organizations and institutions of the Russian Academy of Sciences, Committee on sustainable energy of Economic Commission for Europe, Group of Experts on Coal Mine Methane, in other research and educational centers in Russia and abroad, regardless of legal status.

Research

Modeling of dust generation and dust transfer

For the first time, the regularities of the redistribution of dust-gas-kinetic parameters of the mine atmosphere in the space of a high-performance face are revealed.

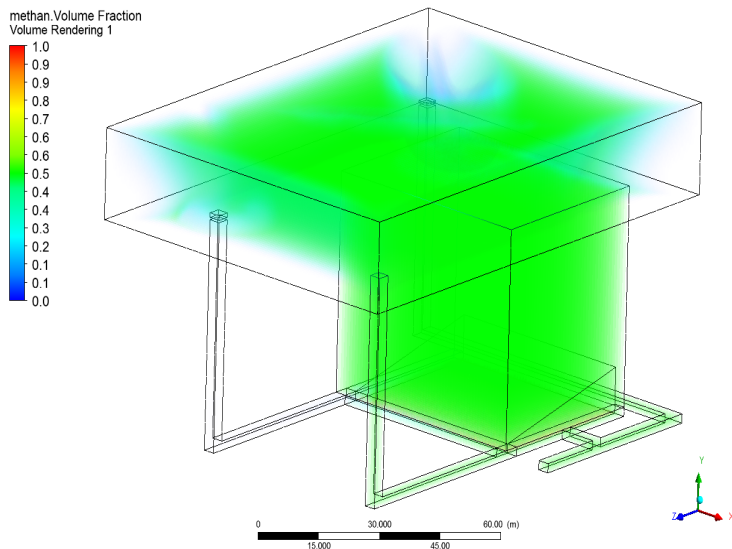


Results of research

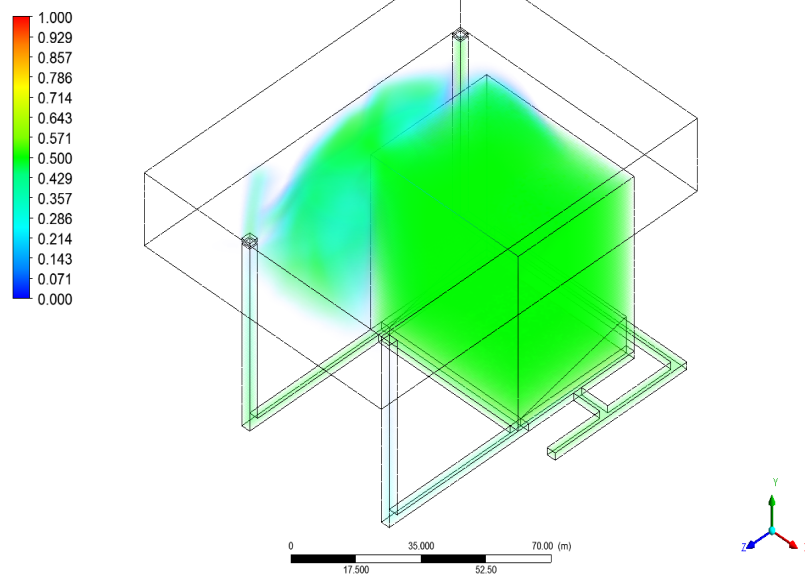
Applications of injection and suction schemes for ventilation of dredged areas for methane release during operations

For the first time, the regularities of separation, mass transfer and formation of local accumulations in the system adjacent mine workings – face – developed space – gas extraction well for injection and suction ventilation schemes are revealed

Injection method of ventilation with the use of removal of methane-air mixture through the empty space

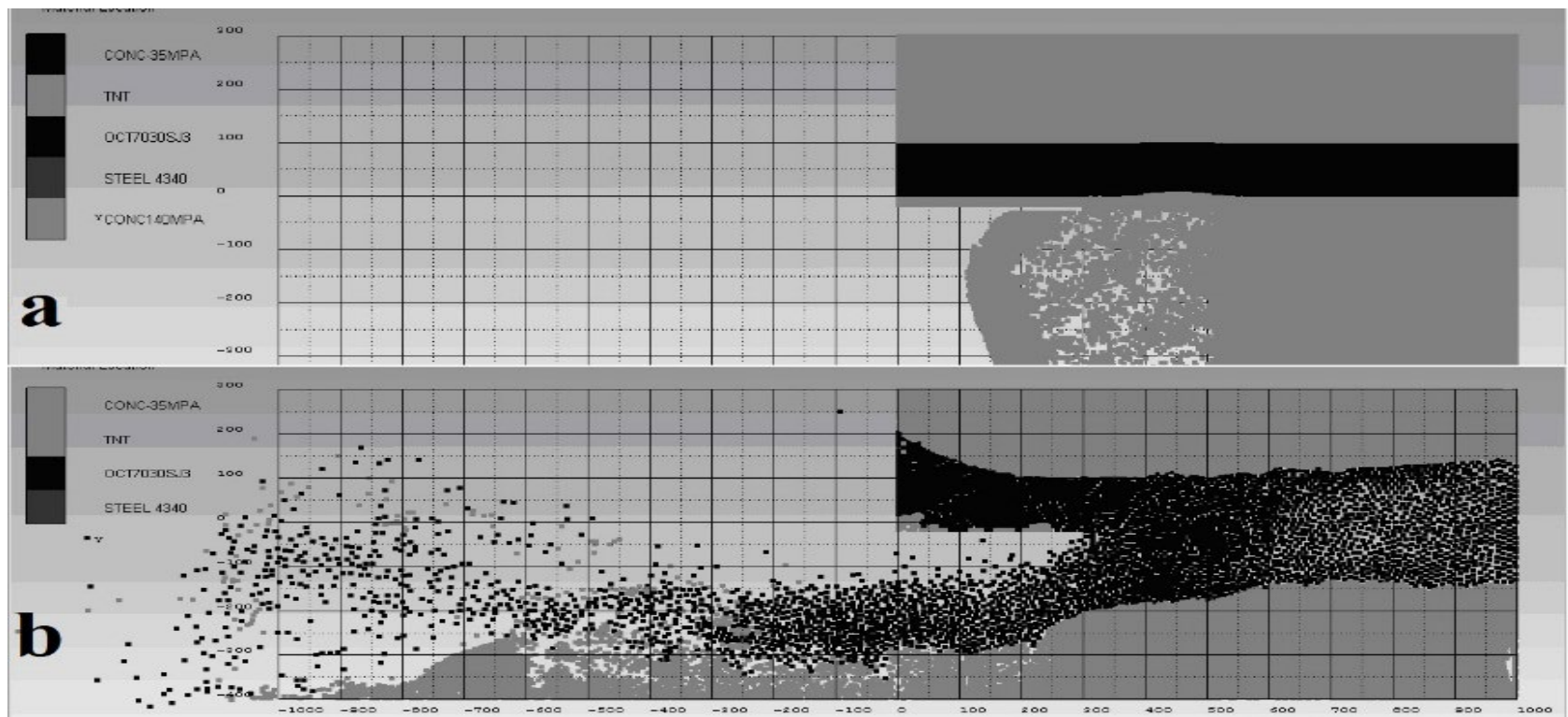


The suction method of ventilation



Numerical simulation

Numerical simulation of changes in the geomechanical state of the host rocks and coal seams during the formation of the worked-out space and identification of the conditions for the dynamic processes of deformation, destruction and gas release. Patterns of deformation and destruction of the rock mass from the volume of the worked-out space, mining of the converged layers and degassing of the coal seam.



From Basic research to R&D

Comprehensive scientific and technical program of the full innovation cycle

PROJECT: "METHANE SAFETY IN THE DEVELOPMENT OF COAL DEPOSITS"

- Basic Research
- R&D. Experimental design and experimental technological work
- Estimation of methane reserves, gas balance, gas emissions
- Extraction of methane, degassing
- Industrial safety
- Utilization and use of methane
- Regulatory documents

International cooperation

DD-MET project «Advanced methane drainage strategy employing underground directional drilling technology for major risk prevention and greenhouse gases emission mitigation»

2019-2023

Supported by

- Research Fund for Coal and Steel (RFCS)
- Ministry of science and high education of Russian Federation

Attends:

- INSTYTUT NAFTY I GAZU - PANSTWOWY INSTYTUT BADAWCZY (INIG-PIB), Poland
- GLOWNY INSTYTUT GORNICWA (GIG), Poland
- UNIVERSIDAD DE OVIEDO (UNIOVI), Spain
- POLSKA GRUPA GORNICZA SA (PGG S.A.), Poland
- IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE (IMPERIAL), United Kingdom,
- INSTITUTE OF COMPREHENSIVE EXPLOITATION OF MINERAL RESOURCES RUSSIAN ACADEMY OF SCIENCES (ICEMR RAS), Russia

**COMPREHENSIVE SCIENTIFIC AND TECHNICAL PROGRAM
«METHANE SAFETY AND ENERGY EFFICIENCY IN THE
DEVELOPMENT OF COAL-GAS DEPOSITS»**

КОМПЛЕКСНАЯ НАУЧНО-ТЕХНИЧЕСКАЯ ПРОГРАММА
综合科技项目

«МЕТАНОБЕЗОПАСНОСТЬ И ЭНЕРГОЭФФЕКТИВНОСТЬ ПРИ
РАЗРАБОТКЕ УГЛЕГАЗОВЫХ МЕСТОРОЖДЕНИЙ»
安全高效开采煤层气

СОГЛАСОВАНО: 同意
Директор ИПКОН РАН
俄罗斯科学院矿产管理研究所副所长
王和军
2019 г.

СОГЛАСОВАНО: 同意
Генеральный секретарь-МДУМ Шаньси КНР
山西煤层瓦斯研究所 所长
贾庆军
2019 г.

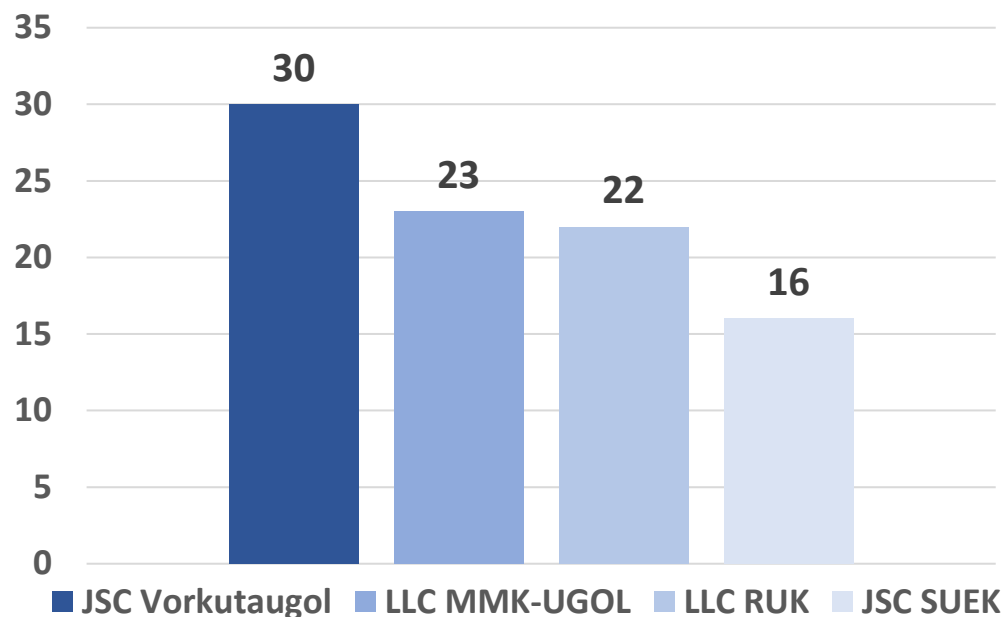


Technology, types of degassing

Companies operating with a natural gas content of more than 15 m3/t

- **LLC RUK** - degassing of coal seam, host rocks, empty space (directional drilling, wells from the surface and underground), predrinage.
- **JSC SUEK** - degassing of coal seam, host rocks, empty space (directional drilling, wells from the surface and underground), predrinage.
- **LLC MMK-UGOL** - degassing of coal seam, host rocks, empty space
- **JSC Vorkutaugol** - degassing of the empty space (wells from the surface and underground).

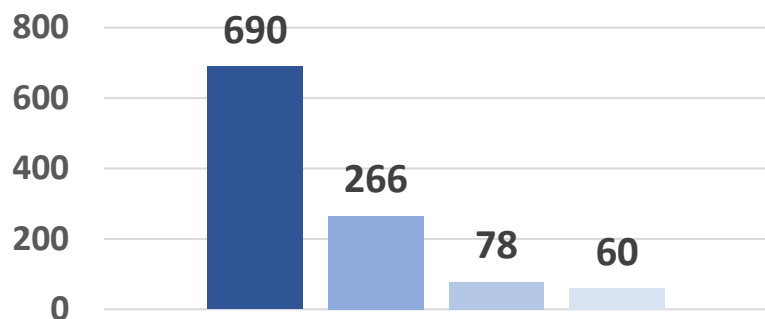
Average natural gas content, m3/t



Drilling, methane extraction

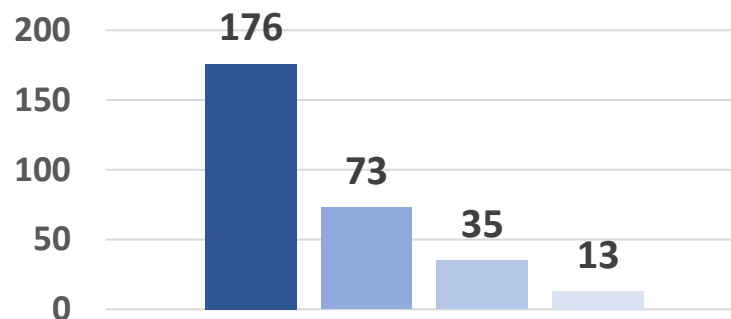
Companies operating with a natural gas content of more than 15 m3/t

Underground drilling, km



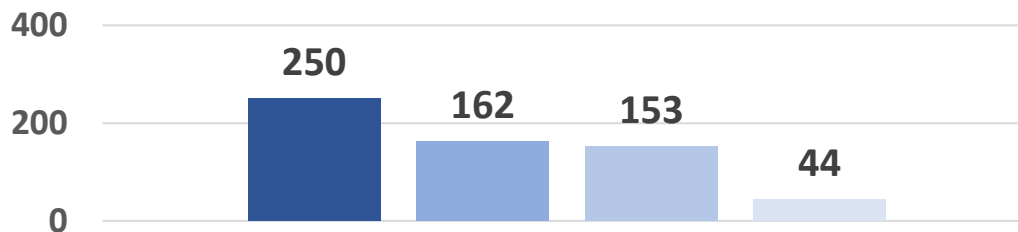
■ LLC RUK
■ LLC MMK-UGOL
■ JSC SUEK
■ JSC Vorkutaugol

Surface drilling, km



■ JSC SUEK
■ LLC RUK
■ JSC Vorkutaugol
■ LLC MMK-UGOL

Methane extraction, million m3/year

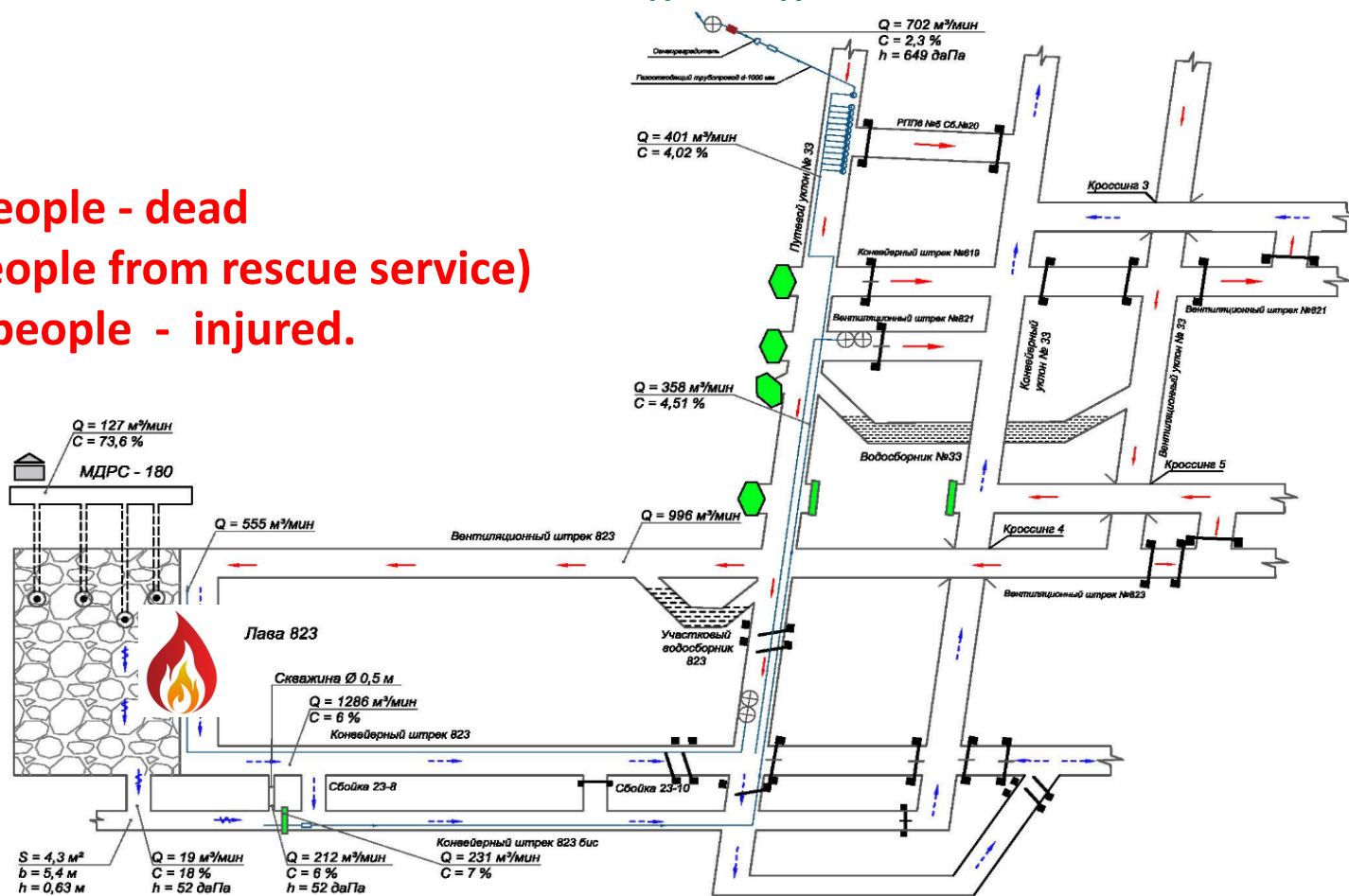


■ LLC RUK ■ JSC SUEK ■ JSC Vorkutaugol ■ LLC MMK-UGOL

«Listvyazhnaya» mine, November 25, 2021

The ventilation scheme of the excavation site №823 at the moment of the accident and degassing of the coal seam.

**51 people - dead
(5 people from rescue service)
106 people - injured.**



Presented by Meshcheryakov D.A., Department of "Safety and Ecology of Mining Production" of Moscow Mining Institute (NUST MISIS)



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Thank you very much for your attention!

