

26th World Gas Conference

1 – 5 June 2015, Paris, France



STRATEGY OF DEVELOPING ACHIMOV DEPOSITS OF URENGOY REGION

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General information on Big Urengoy fields

Three gas-bearing layers:

- Cenomanian
- Neokomian (Valanginian)
- Achimov

Area is more than 5 000 km²

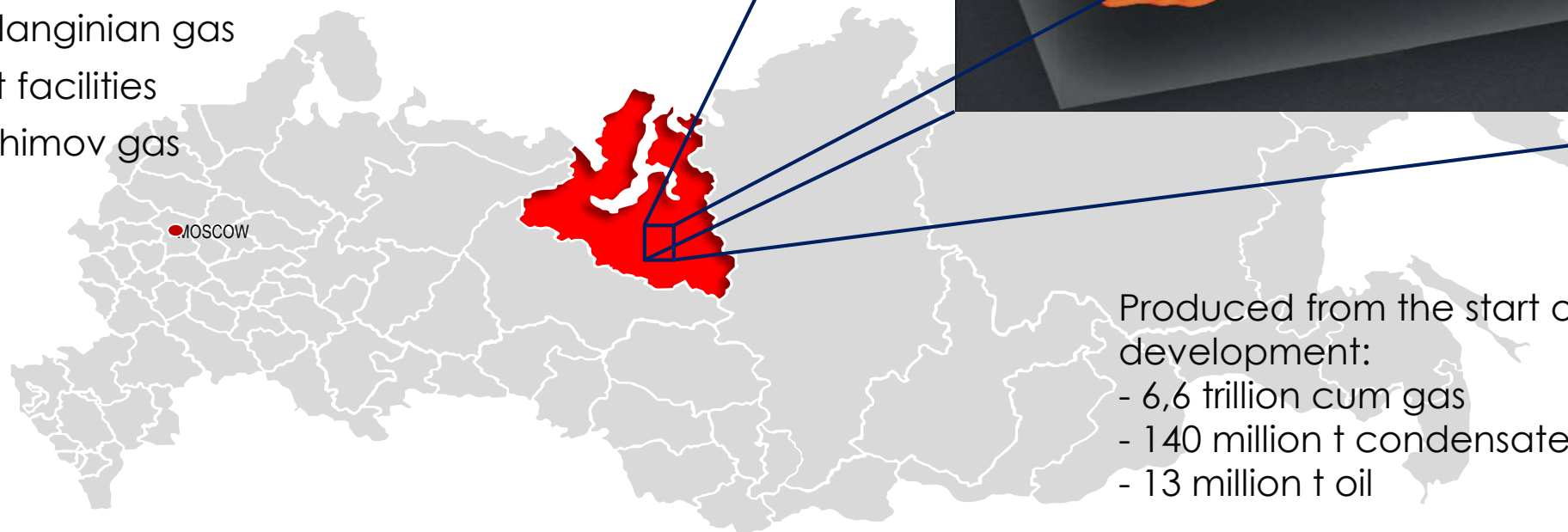
Apprx.3000 wells

16 UKPG for Cenomanian gas

5 UKPG for Valanginian gas

2 oil treatment facilities

2 UKPG for Achimov gas



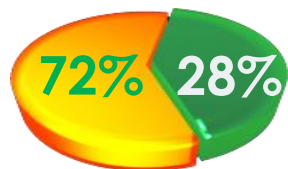
Produced from the start of the development:

- 6,6 trillion cum gas
- 140 million t condensate
- 13 million t oil

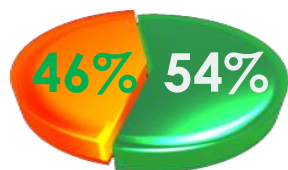
Raw materials reserves in Cenomanian, Valanginian and Achimov formations, fields of Gazprom добыча Urengoy LLC

Reserves depletion

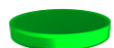
Cenomanian



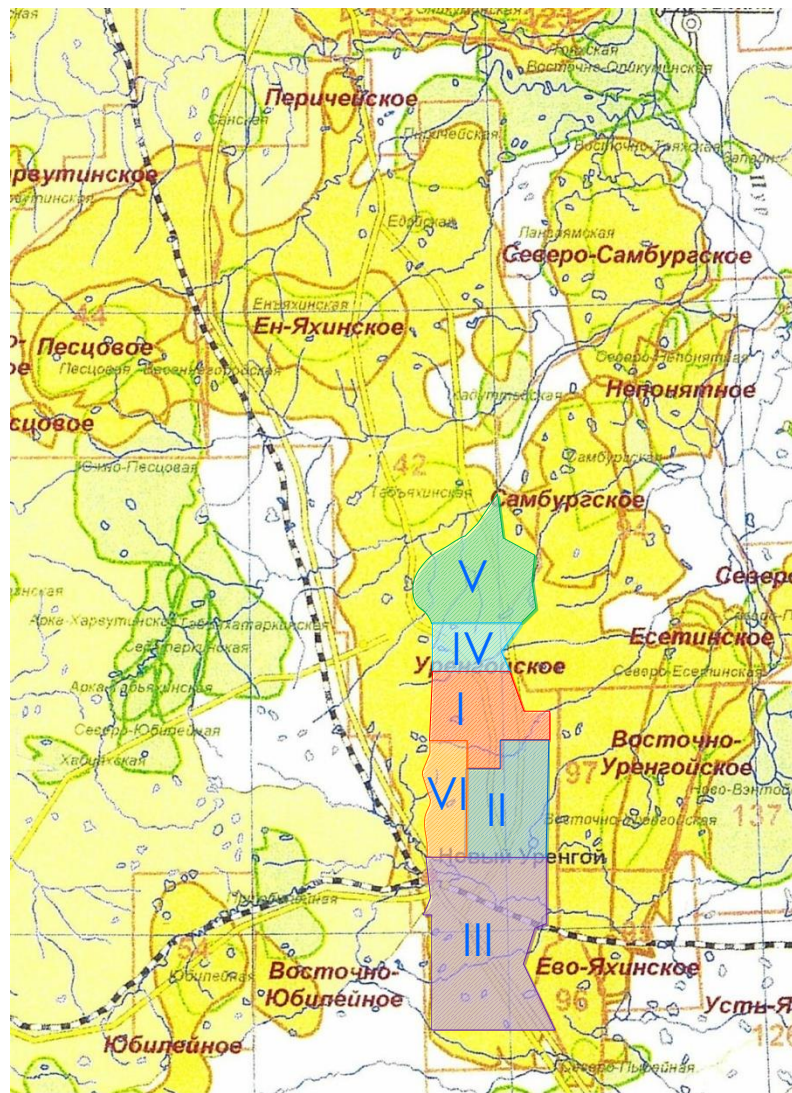
Valanginian



- Extracted reserves

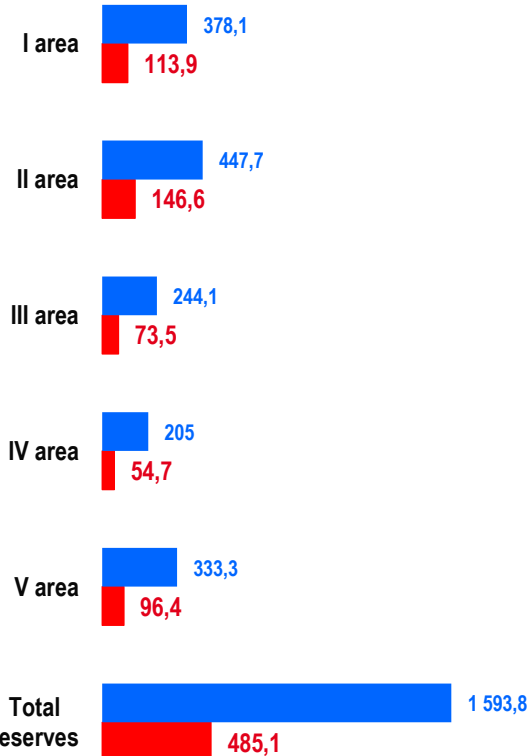


- Current reserves

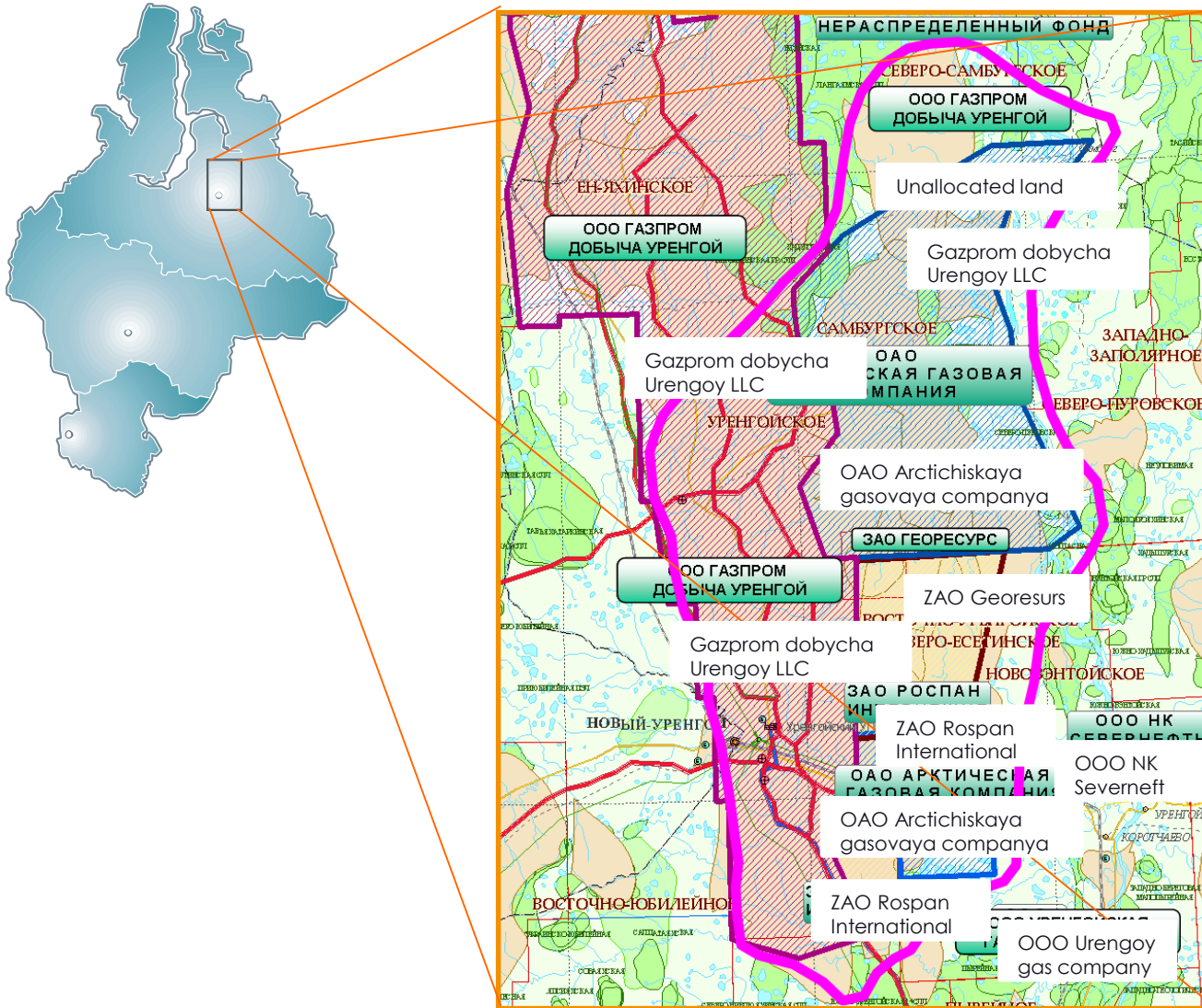


Achimov formations reserves

■ Dry gas, billion cum ■ Condensate, million t



Distribution of license holder rights for Achimov formation, Urengoy field



► Subsoil use rights within the area of main Achimov formation spread belong to three main subsoil users:

Gazprom dobycha Urengoy LLC

► OAO Arcticgaz

► ZAO Rospan International

Productive strata of Achimov formation on Urengoy field were discovered in 1976.

HC saturation of Achimov formation was established in 16 strata.

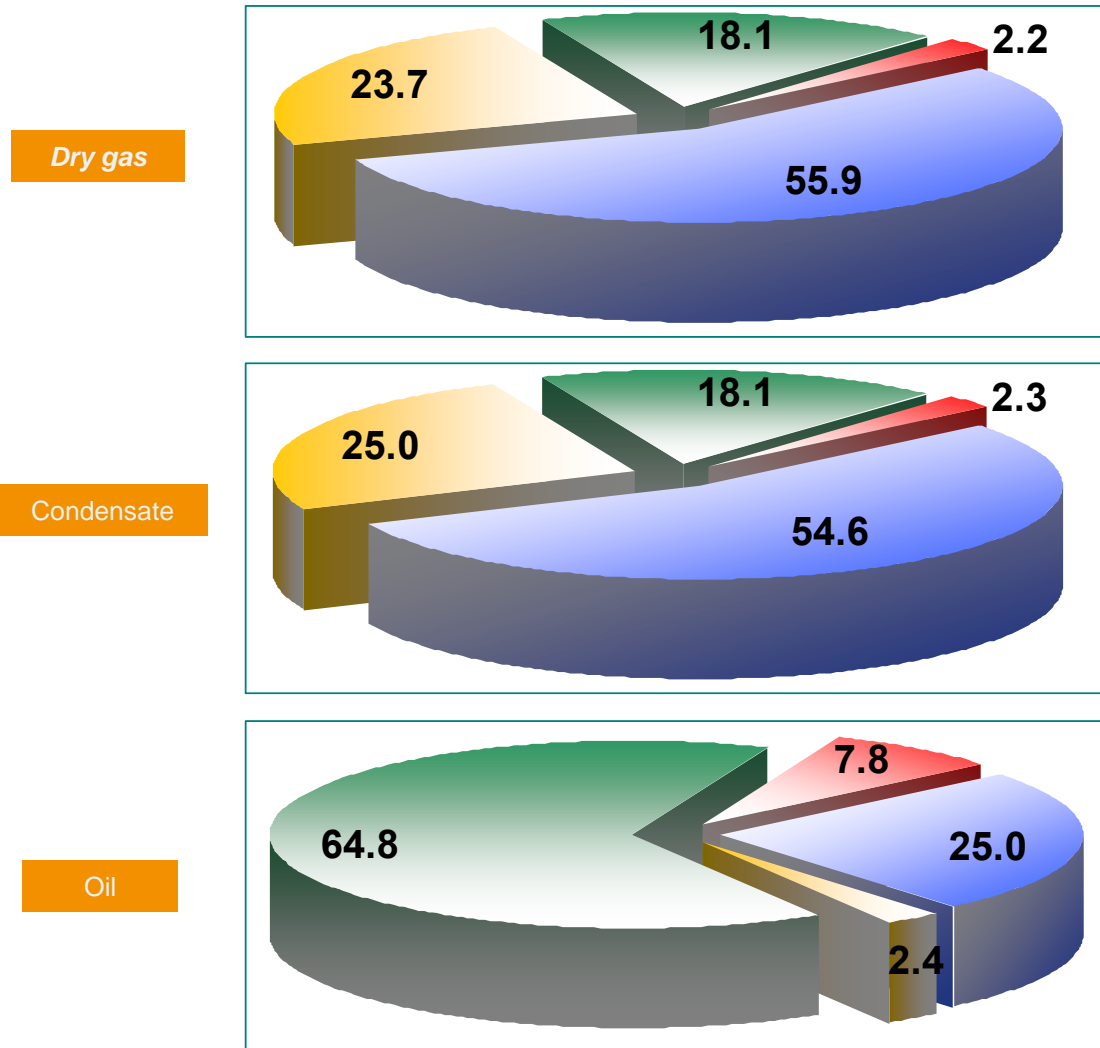
Cumulative geological reserves:

- gas – 2,96 trillion cum

- condensate – 0,48 billion t

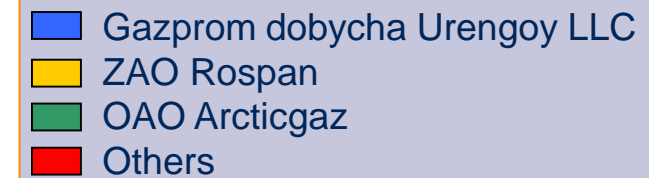
- oil - 0,54 billion t

Distribution of Achimov formations HC reserves between subsoil users

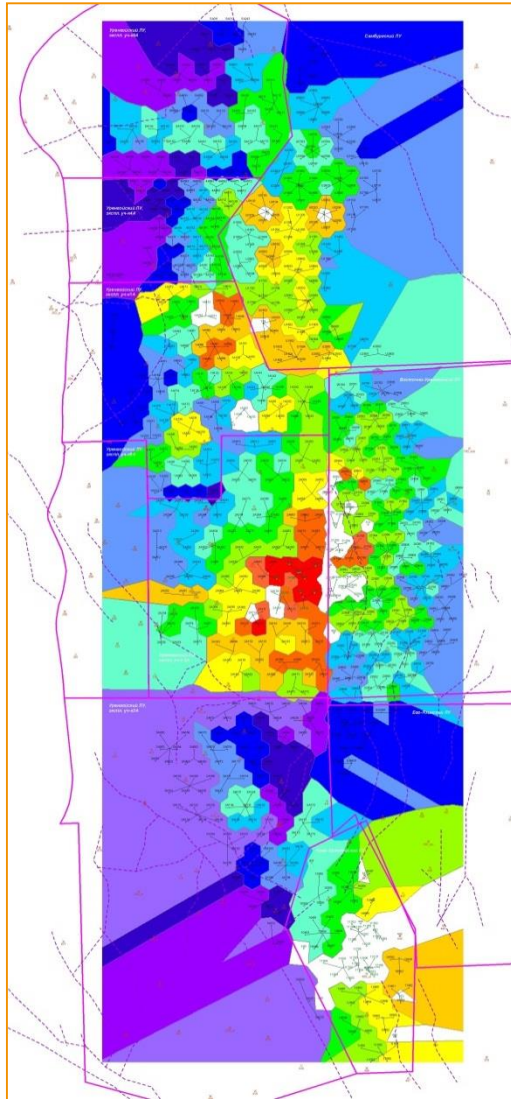


Gazprom dobycha Urengoy LLC owns:

- 56 % of dry gas reserves
- 55 % of condensate reserves
- 25 % of oil reserves



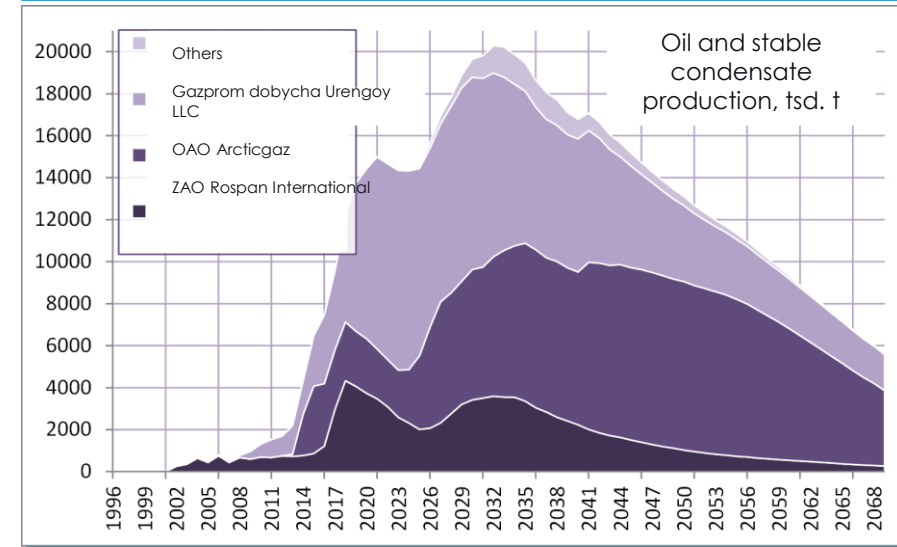
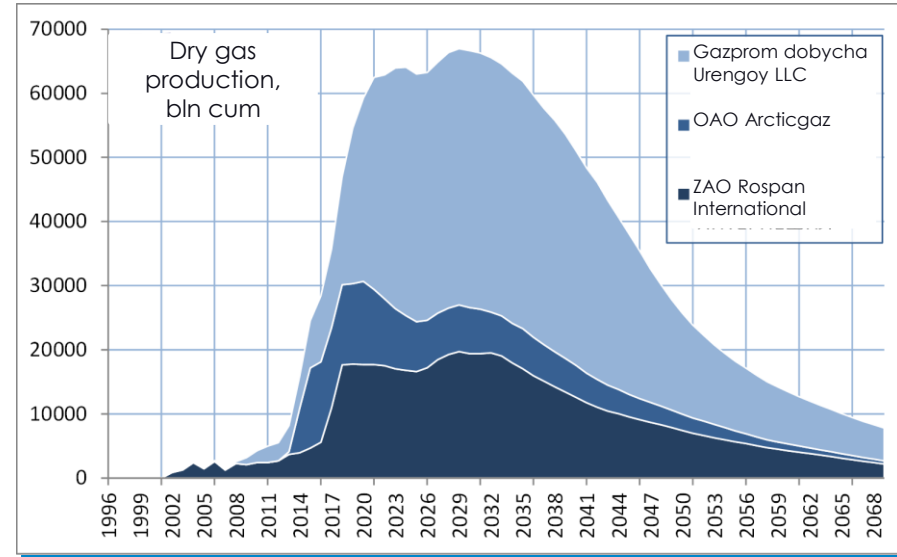
Main parameters of Achimov formation development, Urengoy region



Order of wells commissioning

By 2030 the Company will produce:

Separation gas
434 billion cum
Condensate
129 million t



Development of Achimov formation, Gazprom добыча Urengoy LLC

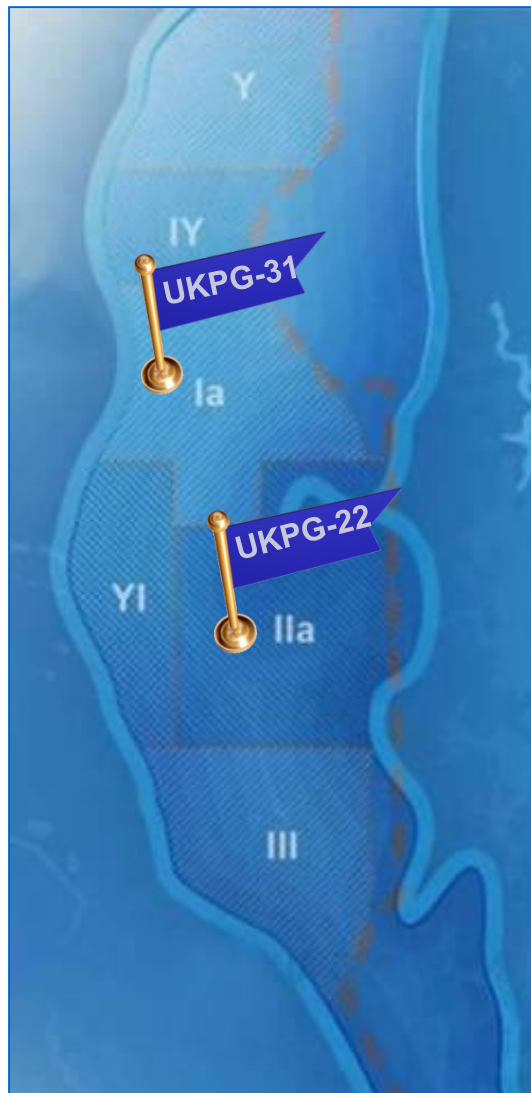
Start of Achimov formation development

In 2008 UKPG-31 was commissioned with the design annual output rate:

- 8,5 billion cum gas
- 2,3 million t unstable condensate

In 2009 UKPG-22 was commissioned with the design annual output rate

- 3,6 billion cum gas
- 1,7 million t unstable condensate



Outlook for Achimov formation development

I area:

- 113 wells
- design output - 10,51 billion cum/year

II area (further development in 2017 году):

- 130 wells
- design output – 9,685 billion cum/year

III area (commissioning in 2019 году):

- 105 wells
- design output – 5,167 billion cum/year

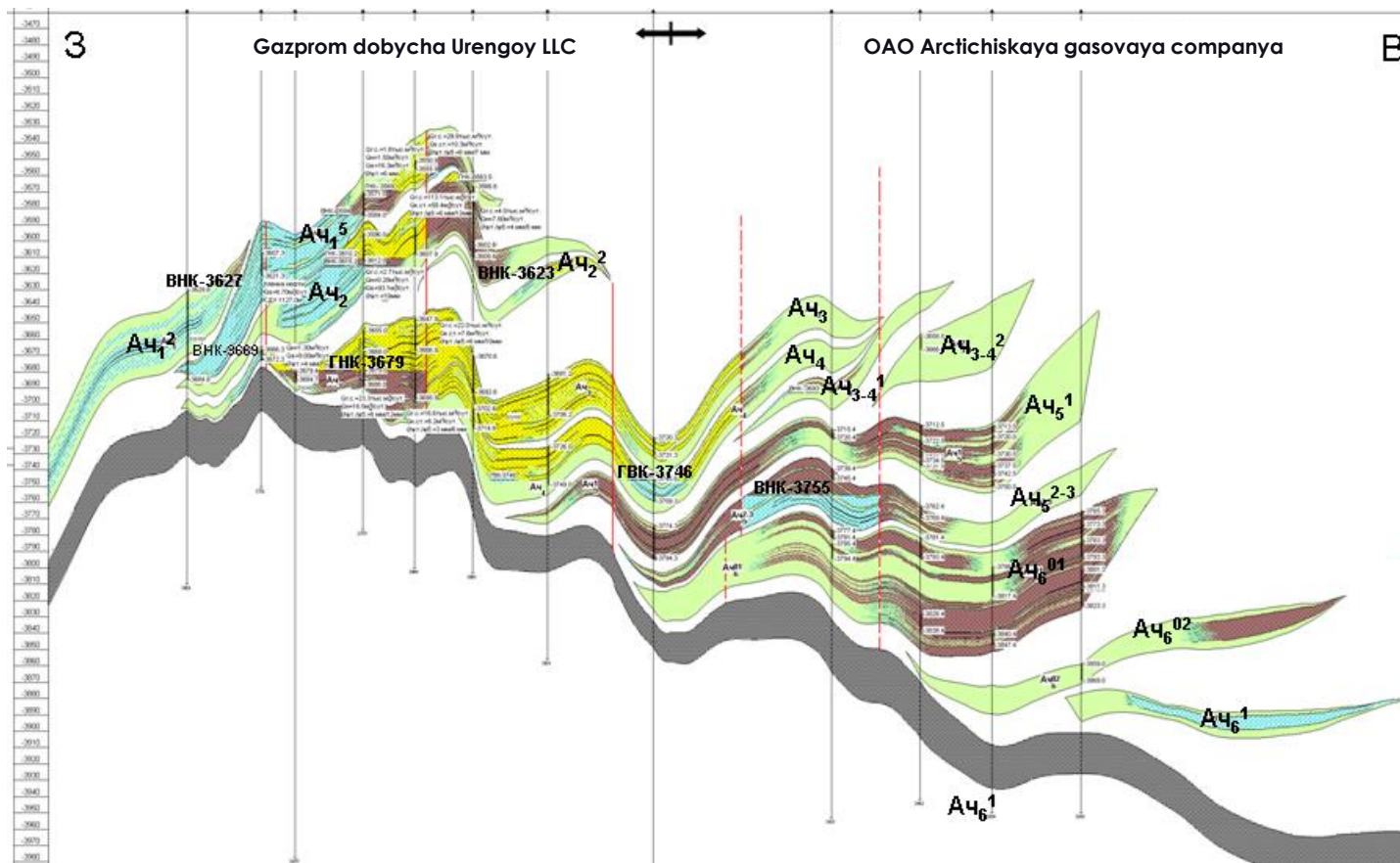
IV area (commissioning in 2017 году):

- 77 wells
- design output – 5,898 billion cum/year

V area (commissioning in 2017 году):

- 87 wells
- design output – 9,588 billion cum/year

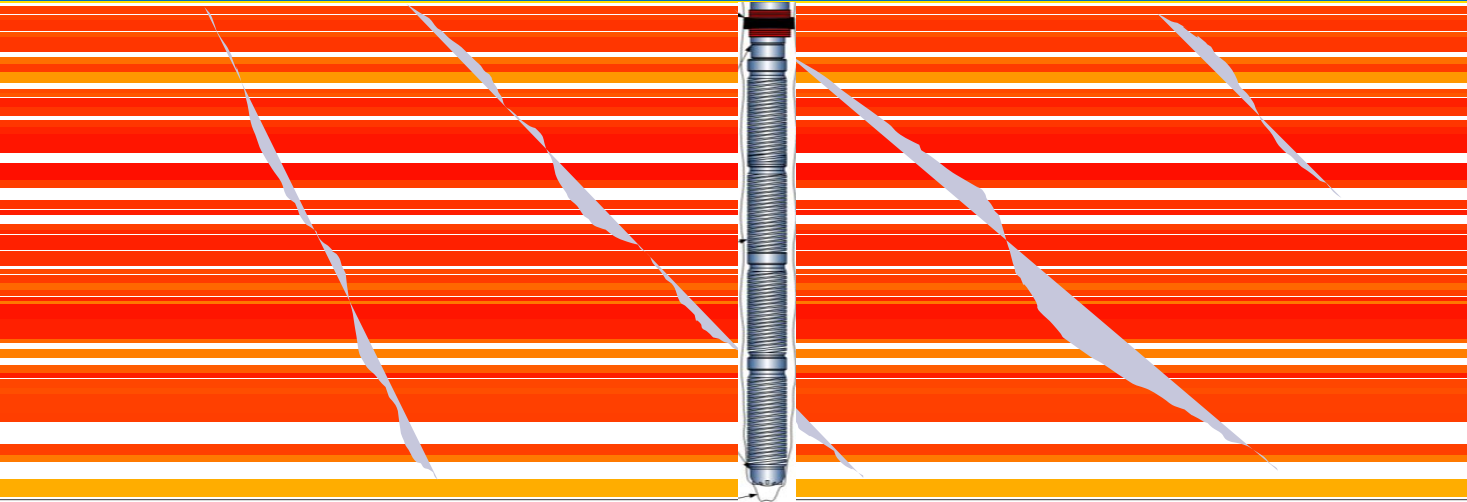
Characteristics of the layers, Achimov formation



Layer index	Porosity, %	Permeability, mDa	Formation pressure, MPa	Formation temperature, °C
Aч ₃₋₄	11-19	0,1-5,4	59	105
Aч ₅	14-17	0,4-3,8	60	106

Evolution of well completion technology. Stages 1-2

1. Vertical formation penetration



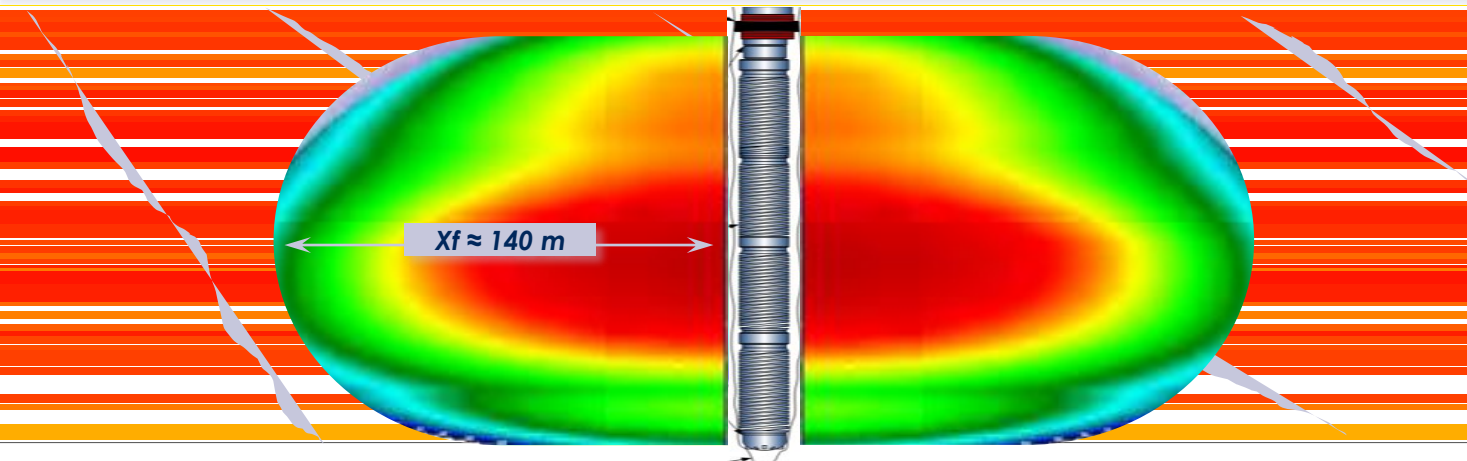
Pros:

- Low cost of construction
- Possibility of massive hydrofracturing

Contras:

- Low output rates
- High drawdown

2. Vertical formation penetration + formation hydrofracturing



Pros:

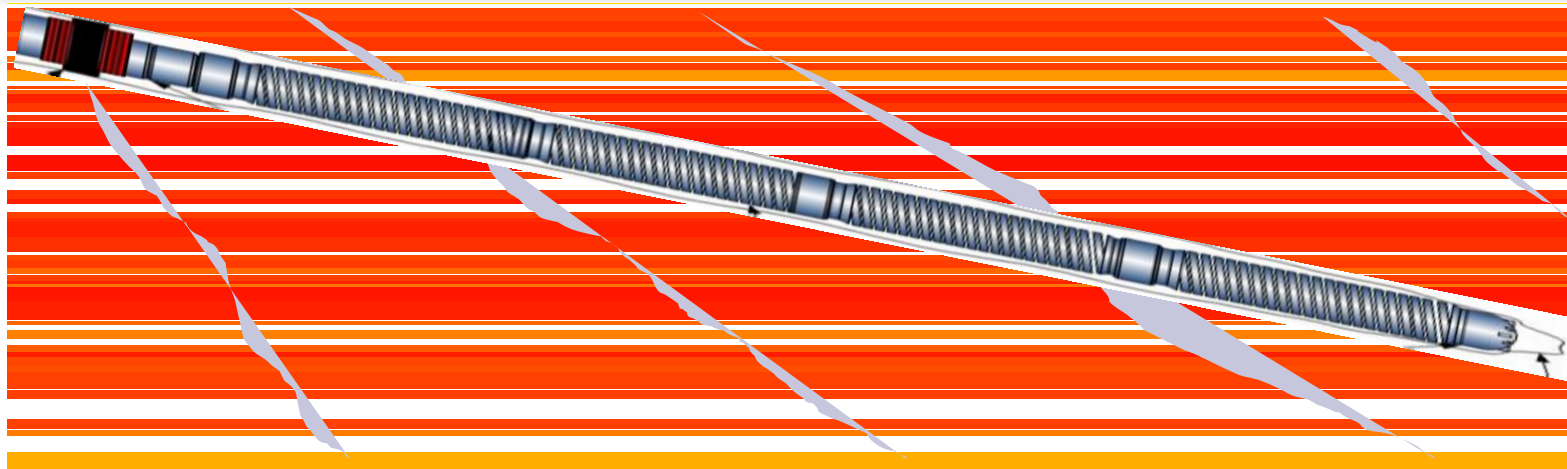
- Tried-and-true technology
- High and stable productivity

Contras:

- Uncontrolled growth of vertical fracs
- Small area of formation drainage

Evolution of well completion technology. Stages 3-4

3. Horizontal wellbore



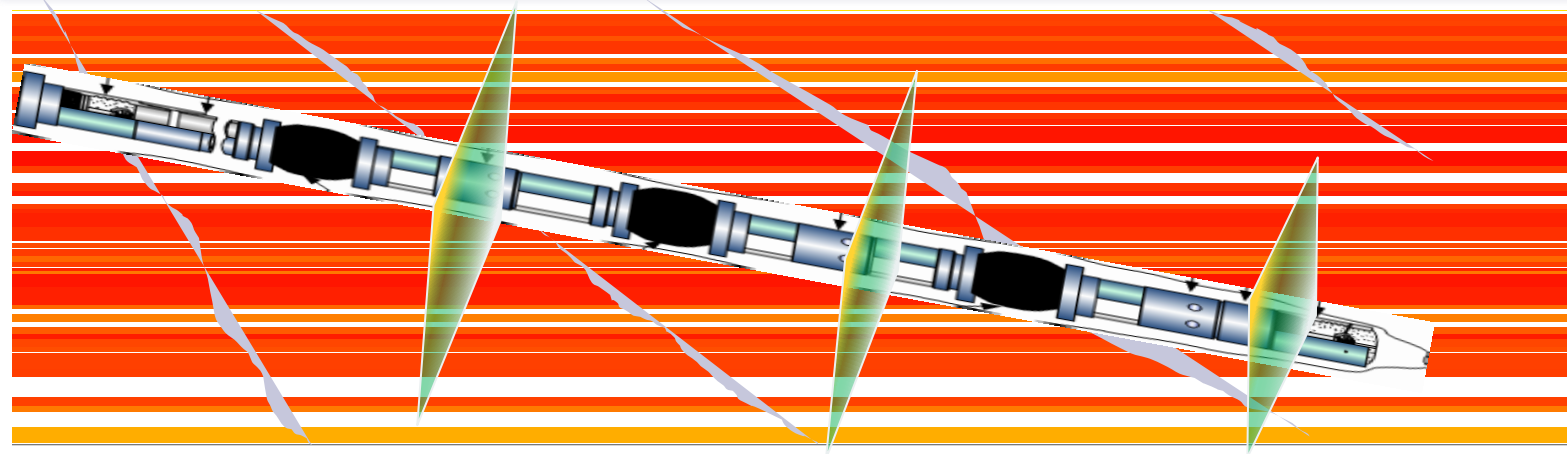
Pros:

- Possibility of wells stock reduction
- Inclusion of distant zones

Contras:

- High cost of construction
- High cost of research

4. Horizontal wellbore + multi-stage hydrofracturing



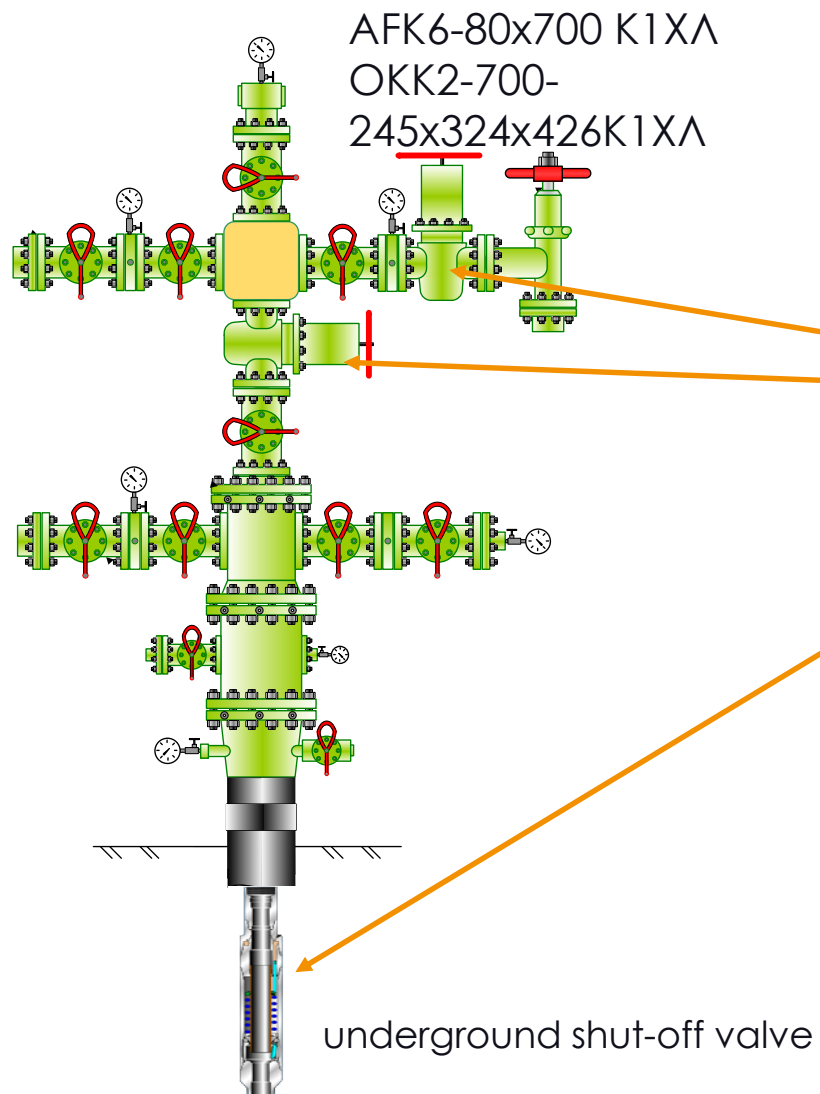
Pros:

- Possibility of wells stock reduction
- Large area of formation drainage

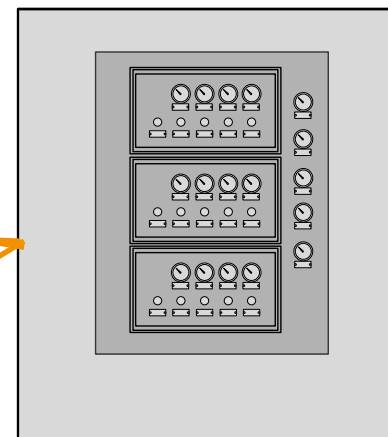
Contras:

- High cost of construction
- High cost of research
- Necessity of a geo-mechanical model

Automated Christmas tree control system



SUFA 12/06 (09)

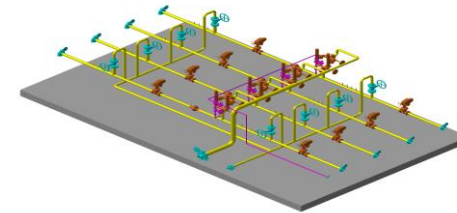


SUFA 12 Christmas tree control station is designed for:

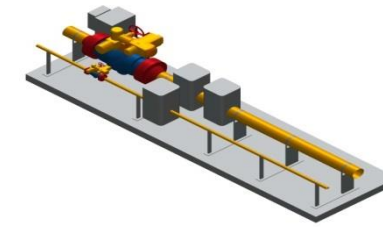
- Christmas tree control (base valve, side valve)
- Underground shut-off valve control
- Shutting the well in the case of pressure increase at the wellhead and depressurization of the discharge pipeline

Technological equipment for wells piping

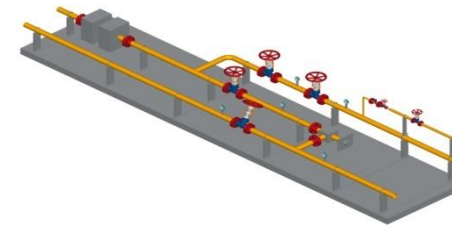
Valve blocks



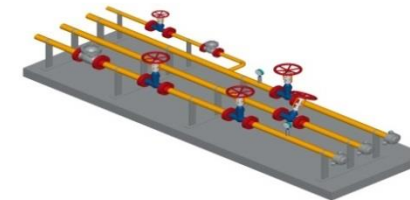
Connection unit for the pipeline and methanol-pipeline



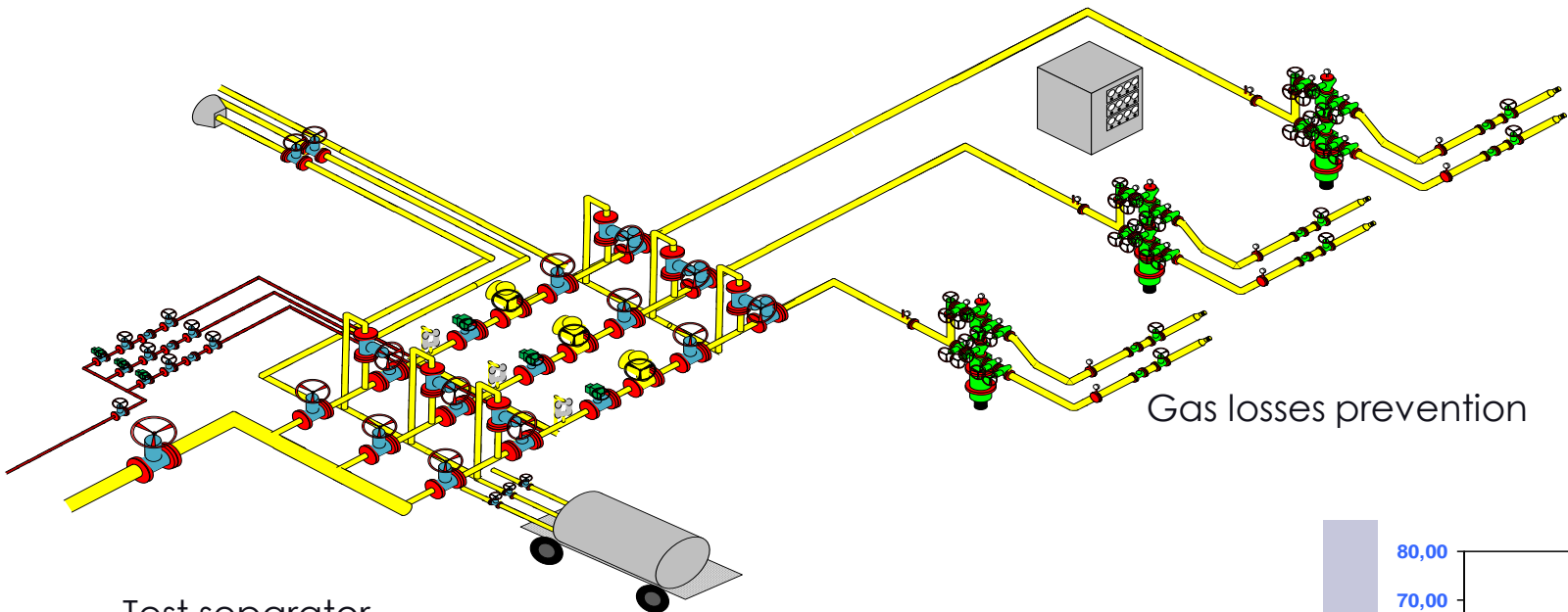
Block of the torch piping



Connection unit for test separators



Wells surveys without gas discharges into the atmosphere



Test separator

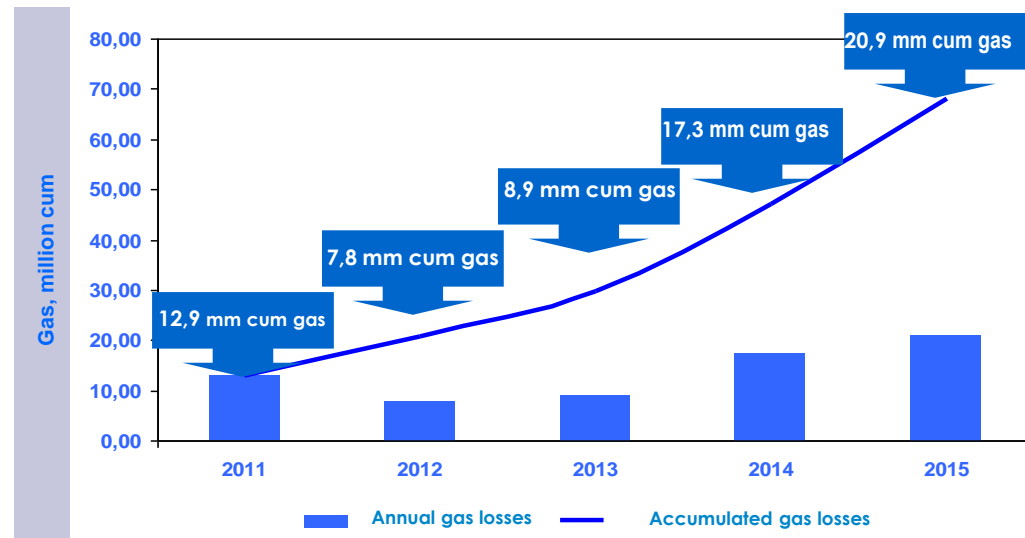
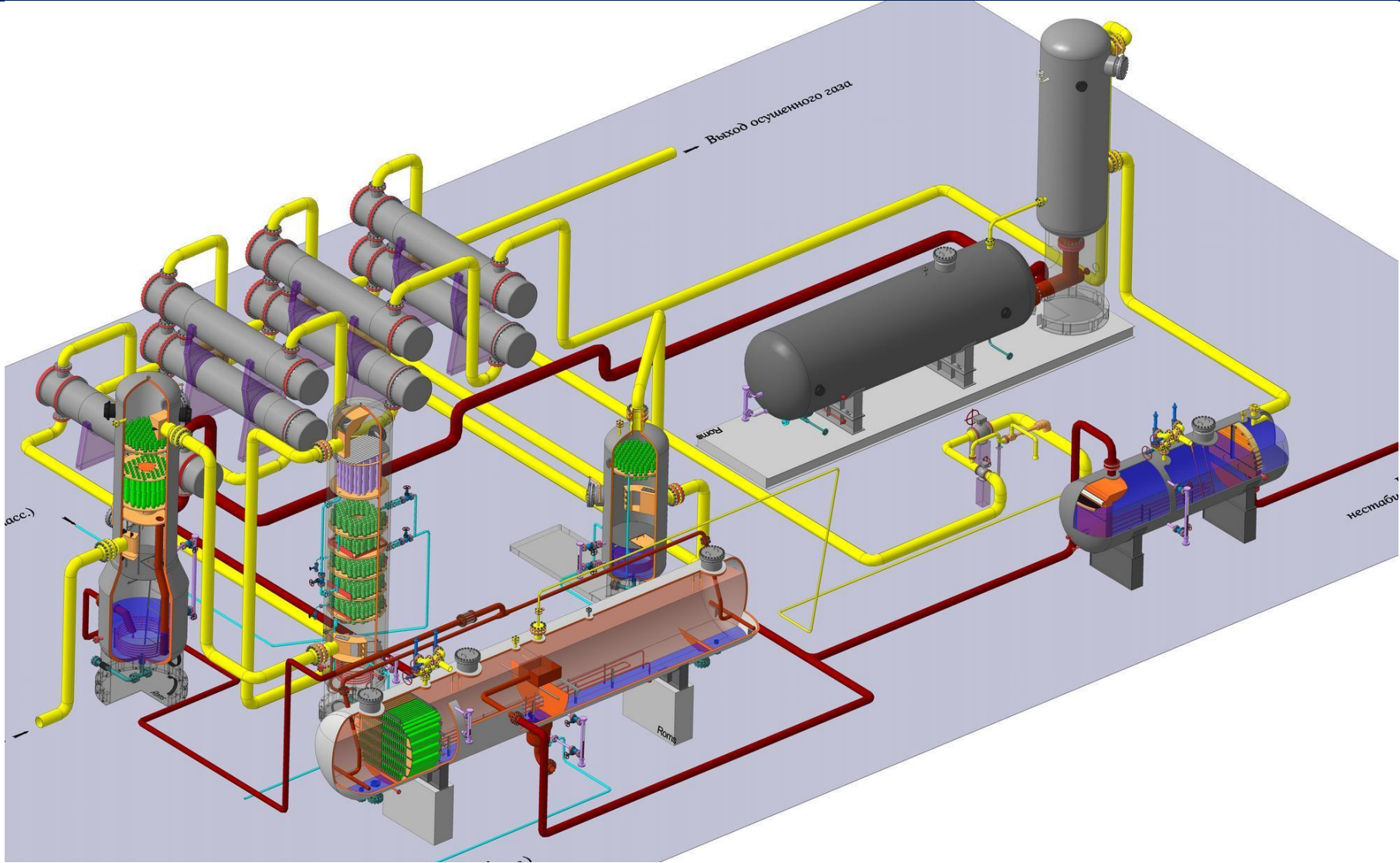
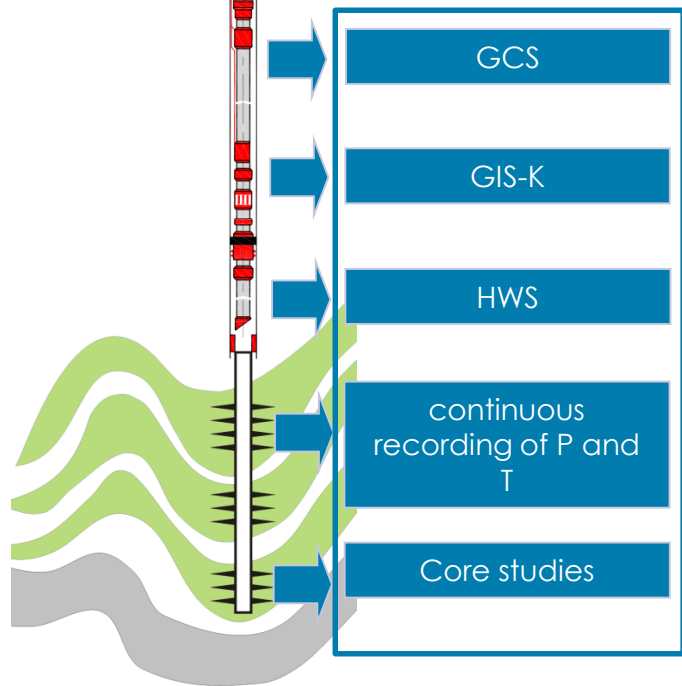
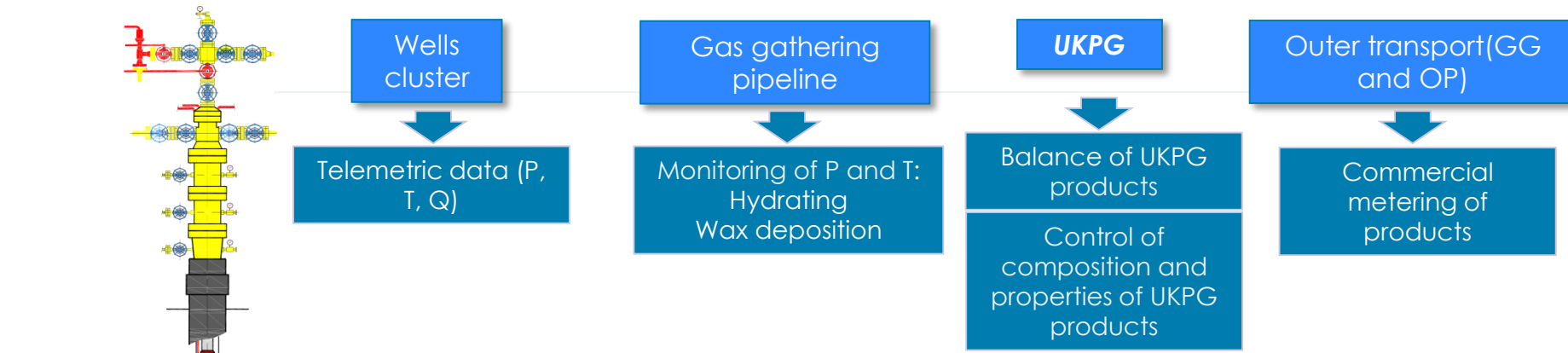


Diagram of LTS unit on UKPG-22



Development monitoring system



Monitoring data	Source	Development control
<ul style="list-style-type: none"> Downhole parameters Wellhead parameters Parameters of gathering and treatment system Service factors 	Telemetry	Adaptation of the single three-dimensional model of Achimov deposits. Defining of technological parameters of the feild development
<ul style="list-style-type: none"> Output distribution per strata 	GIS-K	
<ul style="list-style-type: none"> Material balance of a gas production facility products Data on the composition and properties of production wells 	Laboratory analysis PGCS, laboratory analysis	
<ul style="list-style-type: none"> Output distribution per well 	Flow metering, HWS	
<ul style="list-style-type: none"> Cumulative HC production per area 	Commercial metering units	
<ul style="list-style-type: none"> Hydrodynamic characteristics of reservoir 	HWS, core	

STRATEGY OF DEVELOPING ACHIMOV DEPOSITS OF URENGOY REGION

1. OAO Gazprom, the Government of YANAO, TyumenNllgiprologaz LLC and Gazprom dobycha Urengoy LLC created a strategy of Achimov deposits development for Urengoy region. it is based on a single three-dimensional model of the filtering of the main operational objects. The order of wells commissioning and the parameters of their work was determined to ensure the specified gas output from deposits in view of interests of all subsoil users.
2. On the license areas of Gazprom dobycha Urengoy LLC it is planned to develop additional infrastructure on II pilot area, as well as to start development of areas IV and V; III area is planned for development in 2019. Total annual production of hydrocarbons from Achimov areas by 2025 will reach 35 billion cubic meters of gas and 10 million tonnes of condensate. Until 2030 Gazprom dobycha Urengoy will produce 434 billion cubic meters of separation gas and 129 million tonnes of condensate.
3. Further development of Achimov deposits will require a method of wells drilling with a horizontal formation penetration and multi-stage hydraulic fracturing.
4. Safety of wells operation is ensured due to automated Christmas tree control system. For the ease of installation, maintenance and monitoring of the wells, production equipment sets of each well are made in modular pattern of the individual blocks.
5. To ensure the ecological safety of the operation the following is used:
 - energy-saving technologies for wells surveys without gas discharges into the atmosphere
 - recirculation schemes of methanol supply in the process of low-temperature treatment of gas and condensate
 - a technological scheme for industrial and domestic waste water joint treatment and injection into the reservoir.

An aerial photograph of a large industrial complex, likely a gas processing plant, situated in a flat, open landscape. The facility features numerous large, rectangular buildings with blue roofs and walls, interconnected by a dense network of pipes and walkways. In the background, there are green fields and a winding river or canal. The sky is clear and blue. The text "THANK YOU FOR ATTENTION!" is overlaid in the center of the image in a large, white, sans-serif font.

THANK YOU FOR ATTENTION!