



# Advanced Base Artificial Intelligence ABAI Information System

Full-scale Big Data project applying artificial intelligence in Upstream of NC KazMunayGas JSC



**ҚазМұнайГаз**  
NATIONAL COMPANY ҰЛТТЫҚ КОМПАНИЯСЫ



**КМГ**  
ИНЖИНИРИНГ

# ABAI Modules

Module - specialized software dedicated to solving specific production challenges

Areas	Modules
 <b>Geology</b> ▶	<ul style="list-style-type: none"> <li>• <b>Digital Geology:</b> <ul style="list-style-type: none"> <li>• Automatic log interpretation</li> <li>• Automatic correlation</li> <li>• Automatic core interpretation</li> <li>• Geophysics</li> <li>• Visualization of geological and geophysical information</li> </ul> </li> </ul>
 <b>Drilling</b> ▶	<ul style="list-style-type: none"> <li>• <b>Digital drilling:</b> <ul style="list-style-type: none"> <li>• Database</li> <li>• Online drilling</li> <li>• Design</li> <li>• Analytics</li> <li>• Drilling supervision</li> </ul> </li> </ul>
 <b>Surface facilities</b> ▶	<ul style="list-style-type: none"> <li>• <b>Monitoring of process complications</b></li> </ul>
 <b>Economics</b> ▶	<ul style="list-style-type: none"> <li>• <b>Technical and economic analysis and well stock optimization</b></li> <li>• <b>Economics</b></li> </ul>
 <b>Field development and oil production</b> ▶	<ul style="list-style-type: none"> <li>• <b>Selection of downhole pumping equipment</b></li> <li>• <b>Digital monitoring of well workovers</b></li> <li>• <b>Reservoir fluids</b></li> <li>• <b>Well operation modes</b></li> <li>• <b>Digital Assistant (for Oil Production Units)</b></li> <li>• <b>Waterflood management</b></li> <li>• <b>Selection and performance analysis for well interventions</b></li> <li>• <b>Production planning and monitoring</b></li> <li>• <b>Digital rating of new wells</b></li> </ul>
 <b>System modules</b> ▶	<ul style="list-style-type: none"> <li>• <b>Visualization Center</b></li> <li>• <b>ABAI database</b></li> <li>• <b>Mapper</b></li> </ul>

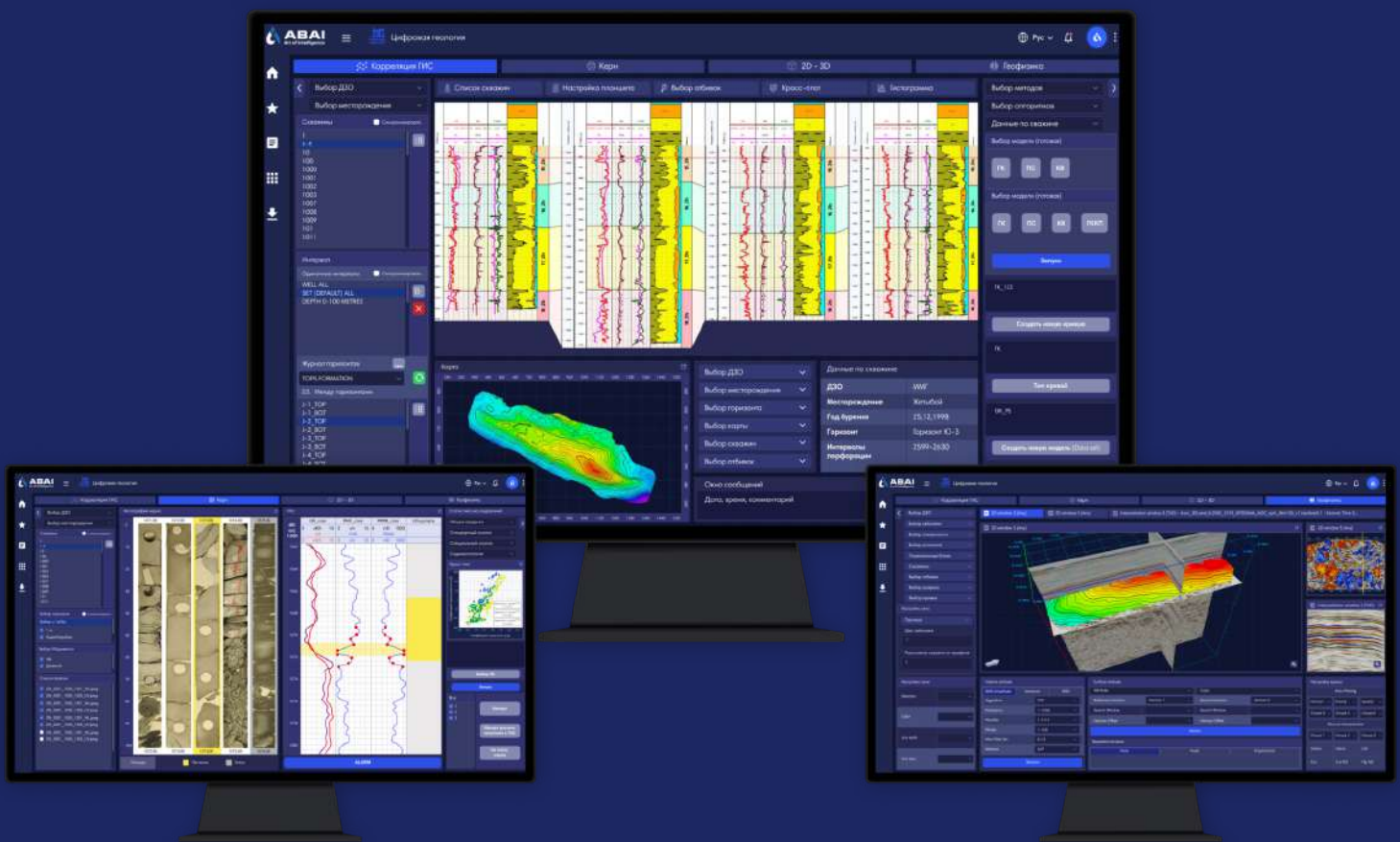


## Module purpose:

- Interpretation of well log and core data using machine learning and visualization of geological and geophysical information

## Functions:

- Interpreting Log Data using Machine Learning
- Automatic correlation by stratigraphic / formation marks
- Determination of lithofacies from a core photo using neural networks / machine learning
- Dynamic and structural interpretation of seismic data - Auto-picking, calculation of coherence cubes, spectral decomposition, RGB-mixing
- Visualization of 1D / 2D / 3D geological and geophysical information
- Final Reports



## Module purpose:

- Well construction design, monitoring key parameters of well drilling

## Functions:

- Visualization of well information (drilling history, daily reports, well passport, results of studies carried out during the well construction process, etc.)
- Data analytics (identifying deviations from design values, identifying hidden non-productive time, etc.)
- Display of information on complications during well construction, forecast of complications
- Calculations (wellbore profile, design calculation, selection of the main parameters of drilling fluids (selection of composition), selection of drilling tools (BHA) in order to identify incompatible drilling conditions, calculation of the well construction period, calculation of estimates for the full cycle of well construction)
- Formation of sections for a technical well construction project by exporting calculated data







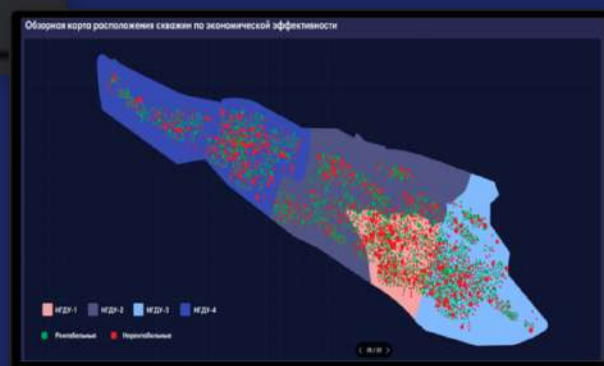
# Technical and economic analysis and well stock optimization

## Module purpose:

- Determining the profitability of wells accounting for various oil prices and other technical and economic assumptions, development of economically viable scenarios

## Functions:

- Automated calculations for actual well profitability
- Automated calculations to determine an optimized field development option based on predicted data
- Development of measures to optimize costs associated with stopping an unprofitable well stock
- Generating reports

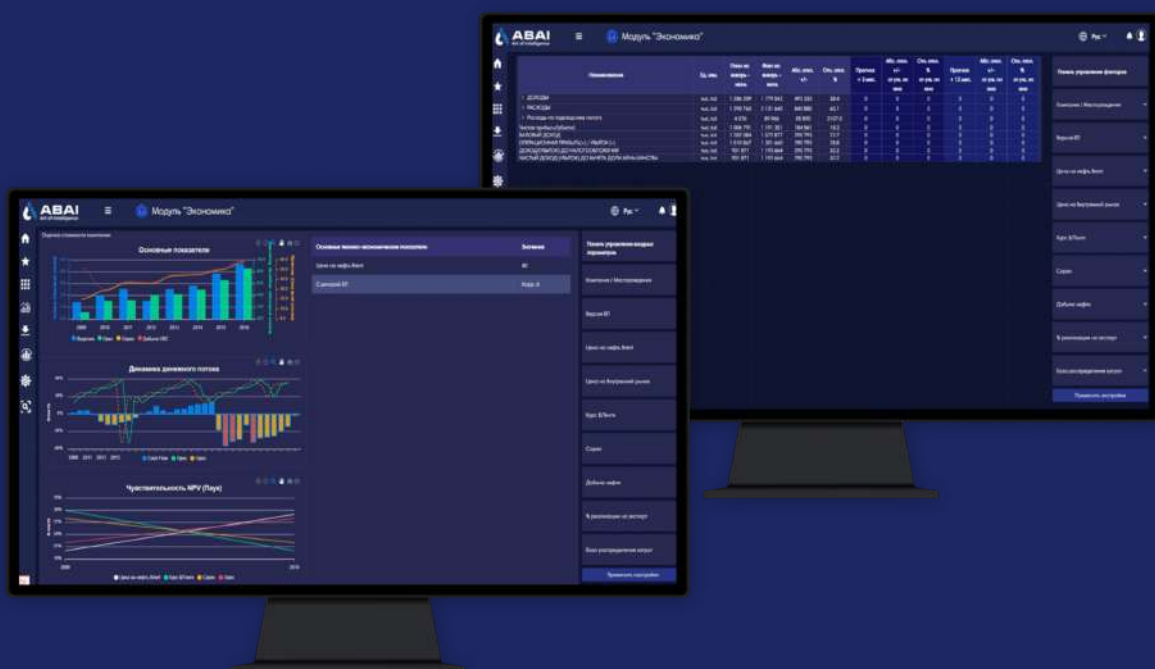


## Module purpose:

- Asset value assessment for oil producing organizations in general and in for operated fields
- Forecasting the operational performance of oil producing organizations and fields using various scenario options

## Functions:

- Automatic generation of a budget execution report and analysis of deviations
- Automatic forecasting of the financial and economic performance of the company for the year
- Automatic calculation of the valuation of companies and fields
- Application of various scenario options to forecast the dynamics of cash flow
- Application of different bases of distribution of income, costs (direct) and assets involved (separate accounting)
- Detailed and accurate calculation of variable costs in accordance with the Tax Code of the Republic of Kazakhstan, the Customs Code of the Republic of Kazakhstan, and tariffs of natural monopolies





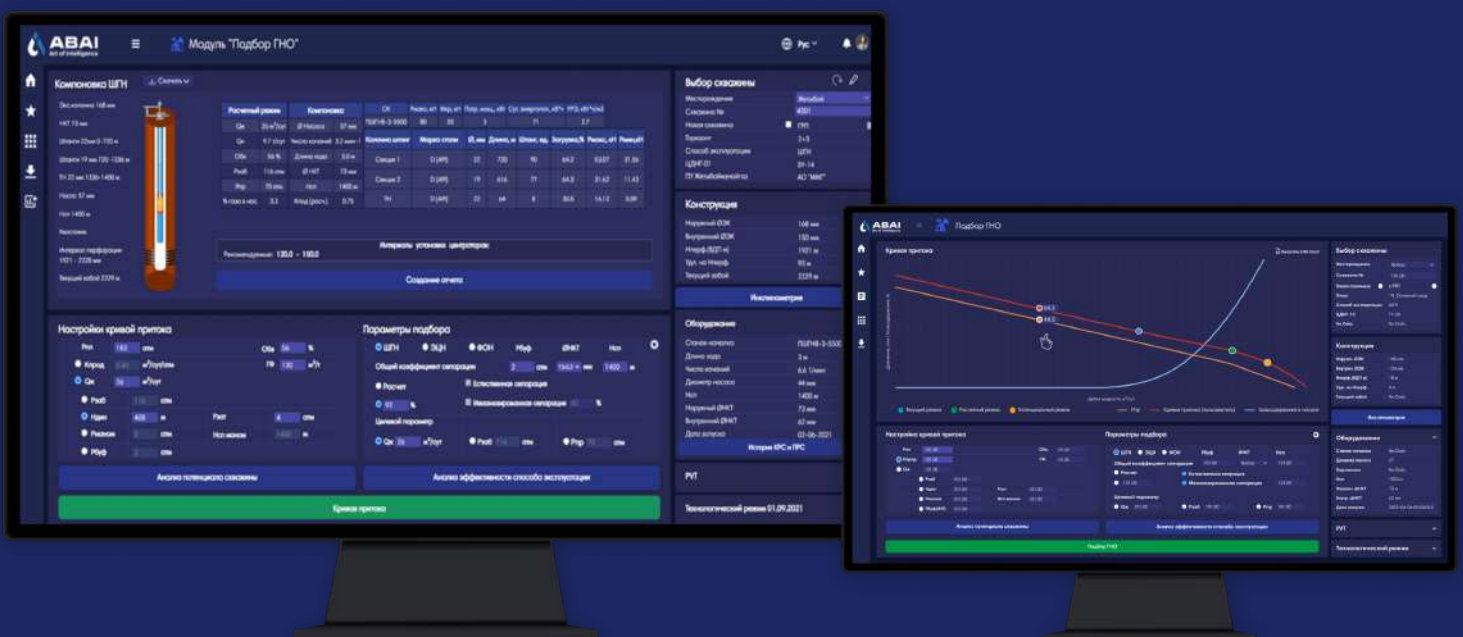
# Selection of Downhole pumping equipment

## Module purpose:

- Selection of downhole pumping equipment based on calculations using automatic aggregation of input data to assess the potential of wells

## Functions:

- Generation and adjustment of the inflow curve.
- Determining the technological potential of existing and new (after drilling) wells
- Choosing the operation method based on a comparative analysis of technical and economic indicators
- History of well workovers (workover, pump changes) and Time-to-failure
- Visualizing wellbore deviation survey
- Calculation of the free flow conditions (nodal analysis - VLP curve, sensitivity analysis)
- Selection of composition of the downhole pumping equipment (sucker rod pumps, ESP) in accordance with the technological potential and planned recovery



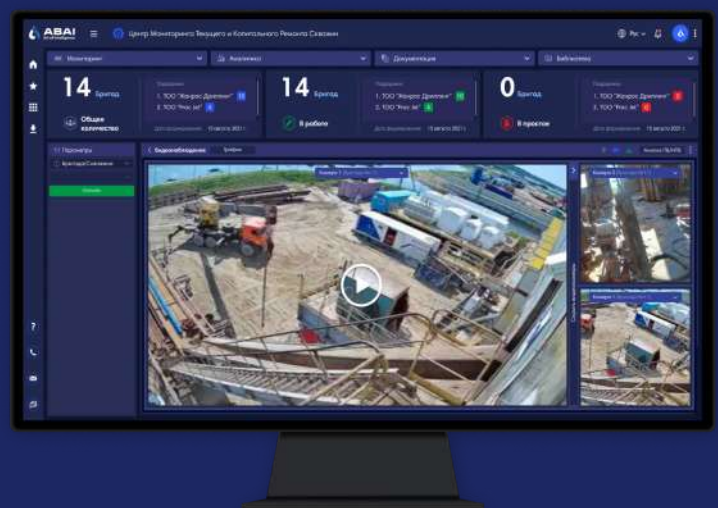


## Module purpose:

- Monitoring and analysis of well workovers, improving their economic performance as well as industrial safety

## Functions:

- Online monitoring of workover technological processes through control systems
- Automated control and time-keeping of workover processes
- Identifying the type of technological process being carried out
- Identifying productive and non-productive times
- Automated control over compliance with the technology and quality of workover (control over compliance with repair parameters, warning of emergencies)
- Automated generation of well workover documentation (daily report, well electronic file, certificate of completion)
- Automated analysis of completed workovers
- Application of video processing technology using CV&ML (Computer Vision and Machine Learning)



## Module purpose:

- Automation of collecting, interpreting and substantiating the data on reservoir fluids properties

## Functions:

- Database of the results of reservoir fluid studies (composition and properties)
- Interpreting the results of reservoir fluid studies based on mathematical models
- Data quality assessment, quality control of PVT parameters for use in petrophysical, geological and hydrodynamic models
- Calculation of fluid properties by correlations, calculation of reservoir fluid parameters in the absence of data, a small amount of experimental data and in conditions of high uncertainty in the format of the dependence of the properties of different phases of the fluid on temperature and pressure conditions
- Analysis and interpretation of reservoir fluid properties, data QC, property justification for building a compositional model
- Generating reports





# Well operation mode

## Module purpose:

- Automatic determination of the well potential and suggestion of the well operation mode

## Functions:

- Building well operation modes - monthly automatic formation of well operation modes for the entire producing well stock based on the approved methodology
- Monthly and weekly factor analysis of actual production deviation - provides the user with an analysis based on changes in 5 factors (reservoir pressure, bottomhole pressure, productivity factor, water cut and well operation factor)
- Building analytical graphs based on the well operation data and factor analysis - construction of various analytical graphs
- Editing mode - gives the user the opportunity to correct certain parameters, while the parameters of the "Intended mode" are subject to saving, the rest are available only in the "Calculator" mode



# Digital Assistant (for Oil & Gas Production units)

## Module purpose:

- Automation of well stock maintenance and registration of equipment operation parameters

## Functions:

- Displaying instructions and documents for day-to-day operations, including parameters for service objects
- Transfer of parameters measured on the maintained objects
- Informing about deviations identified during the maintenance of production equipment
- Monitoring the status of maintenance of production equipment
- Monitoring performance indicators of a structural unit
- Safety control during the maintenance works





## Module purpose:

- Improving the efficiency of the reservoir pressure maintenance system

## Functions:

- Identification of Areas with Waterflood Potential
- Visualization of development maps and diagnostic plots
- Determination of the mutual influence coefficients for injection and production wells based on historical data
- Generation of multiple short period scenarios aimed at optimization of waterflood management
- Consideration of geological and technological limitations (auto-hydraulic fracturing, ground infrastructure)
- Dynamic monitoring of recommendations implementation
- Generation of automatic reports and data export





# Selection and performance analysis for well interventions

## Module purpose:

- Selection, technical and economic analysis and monitoring of well interventions

## Functions:

- Visualizing technical and economic indicators for oil production
- Analysis of the technological and economic efficiency of well interventions
- Factor analysis of the success rate of well interventions
- Determining the reasons for underperformance of well interventions
- Automatic selection of candidate wells for well interventions using machine learning methods
- Ranking of candidate wells by technological and economic indicators
- Building short and long term well intervention programs
- Visualization and generation of reports





## Module purpose:

- Forecast of production levels for the short and long term, monitoring and factor analysis

## Functions:

- Monitoring of production and process indicators
- Factor analysis for meeting production targets
- Forecasting Baseline Oil Production Using Displacement Characteristics
- Forecasting production from drilling
- Forecasting additional production from well interventions
- Business planning for oil production
- Assessment of the current state of development
- Building long-term development programs for field development projects
- Generating reports

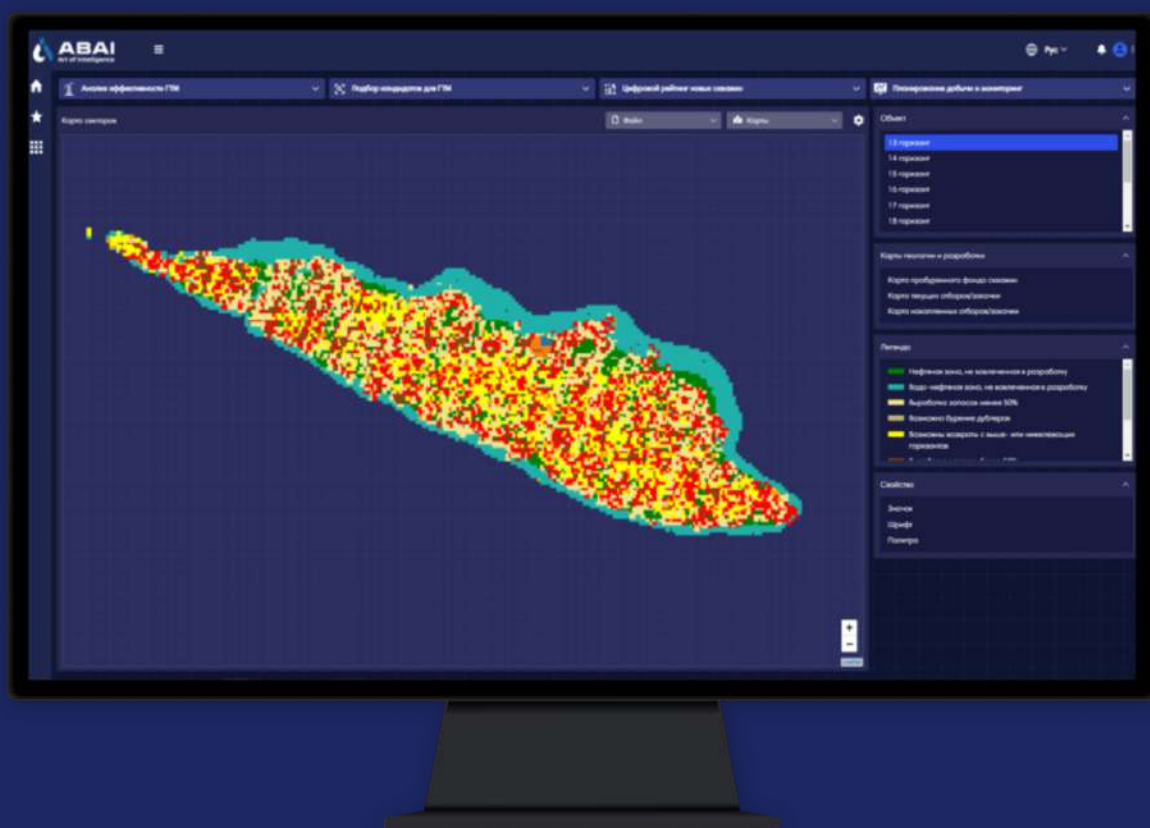


## Module purpose:

- Interactive tool for planning and ranking the planned well stock

## Functions:

- Building sector maps based on geological and technical data and analysis of current parameters of wells
- Well start-up performance forecast using machine learning
- Feasibility study based on the digital rating of a potential drilling candidate
- Building atlases for surrounding wells
- Building medium term drilling program
- Comparing actual drilling points with design and technical documentation
- Generating reports





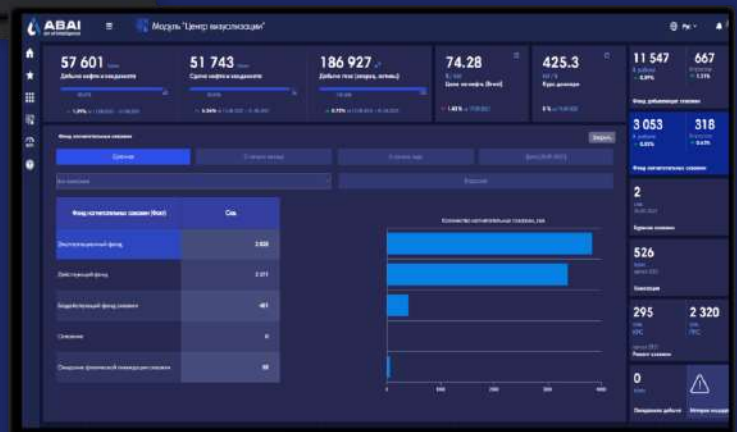
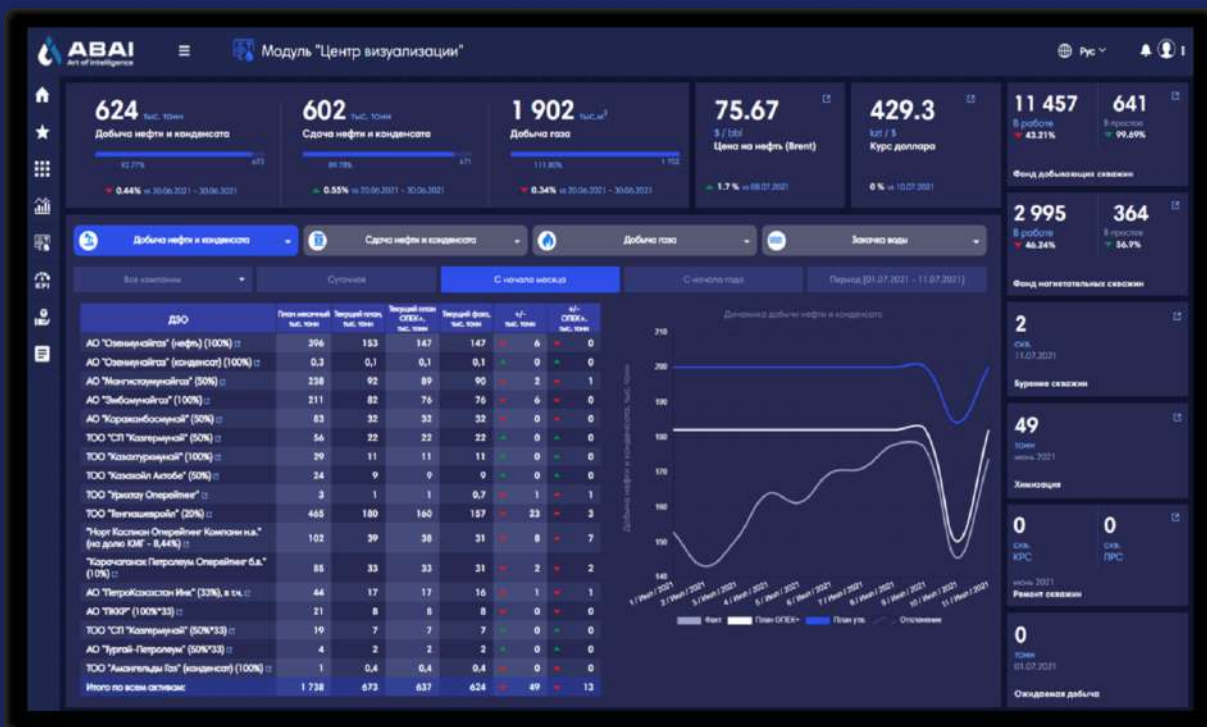


## Module purpose:

- Visualization and monitoring of key production and strategic indicators

## Functions:

- Building operational web reporting on the main production indicators (production, drilling, well workovers, injection, production chemicals, well stock, etc.)
- Generating daily operational reports
- Info widgets integrated with third-party info resources

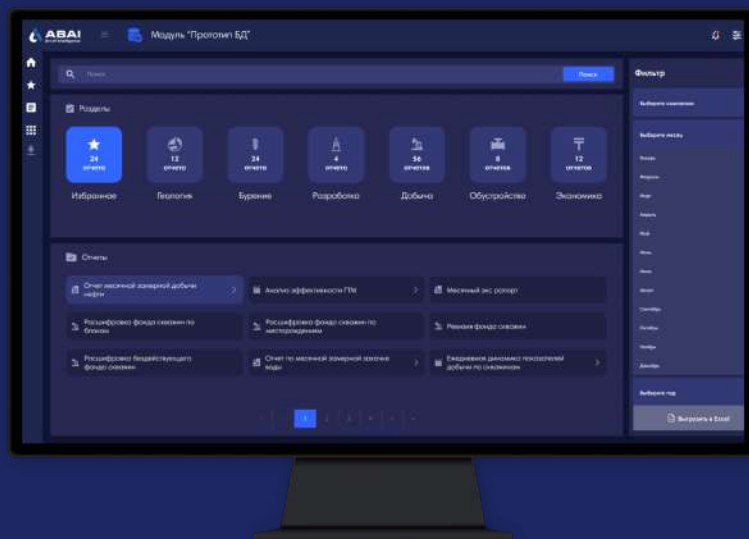


## Module purpose:

- Creating a single centralized database for production assets based on Big Data

## Functions:

- **Database by areas:** geology, field development, production, economics, surface facilities
- **Data validation**
- **Registration and accounting forms**
  - measurement logs
  - registration forms for well activities
  - registration forms for research results
  - registration forms for scanned documents
- **Basic reporting forms**
  - production / injection
  - well stock
  - research
  - system reporting
  - technological modes
  - gradation of wells according to the main field development indicators
  - reporting by production zones
  - Well workovers
- **Report generator**

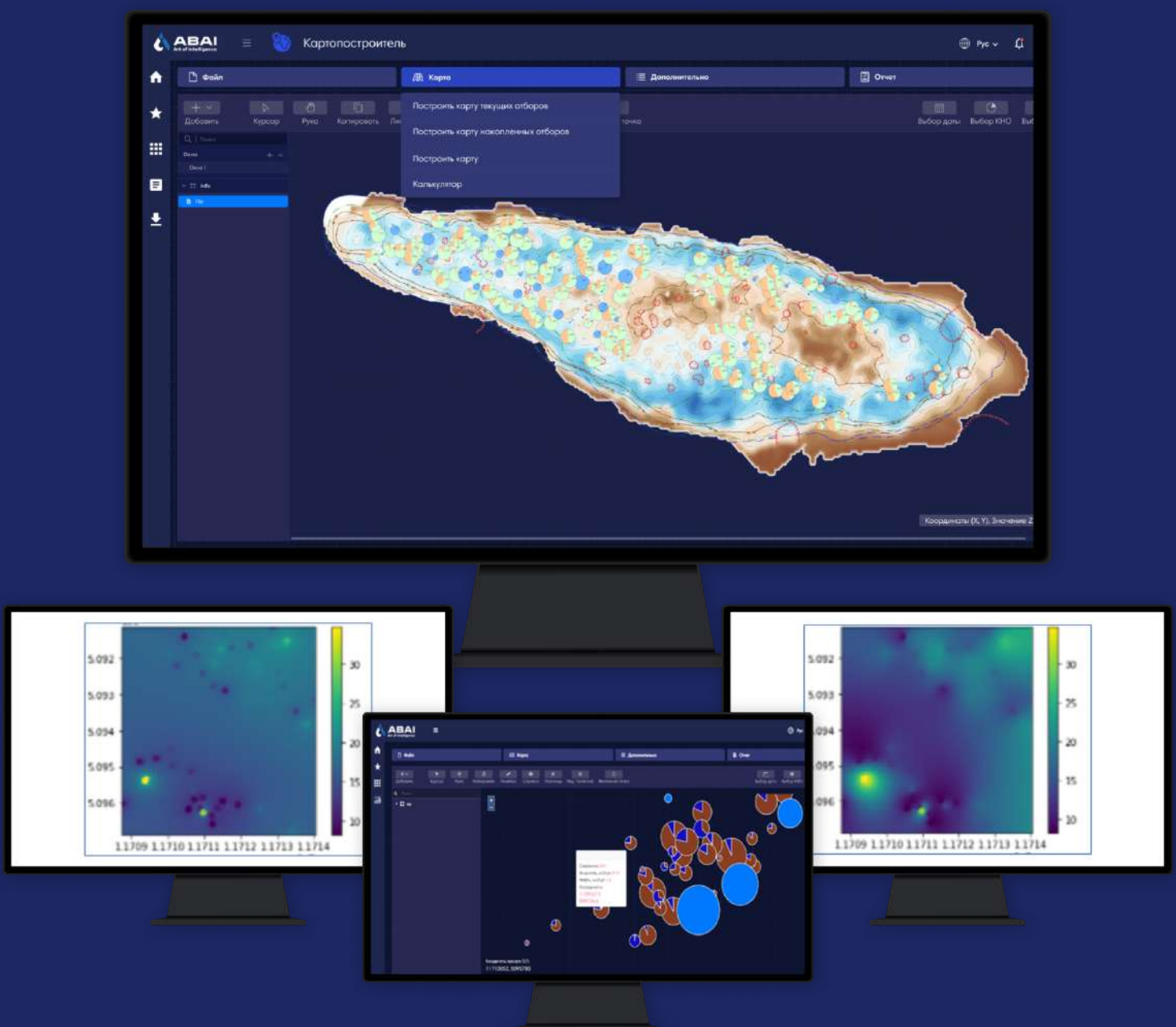


## Module purpose:

- Cartographic presentation of geological field information for use in analytical work

## Functions:

- Building 2D development maps (bubble, thickness, isobar, kN), structure maps, infrastructure maps
- Editing maps
- Map calculator
- Uploading / downloading maps of basic formats
- Generation of reports



E-mail: abai@kmg.kz



**ҚазМұнайГаз**  
NATIONAL COMPANY ҰЛТТЫҚ КОМПАНИЯСЫ

