

METHODICAL APPROACHES TO DRAWING UP STRATEGY OF GAS INDUSTRY INTEGRATED DEVELOPMENT IN LATIN AMERICA

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A comprehensive long-term strategy for gas sector of Latin America is intended for providing sustainable gas supply both to internal and external markets, for improving gas production, storage, transmission and processing technologies, and for strengthening integration of the region countries. The development of such program requires addressing the following targets:

- Assessment of the state and prospects for mineral-resource base development
- Assessment of the dynamics of production capabilities for future
- Forecast of volumes of gas export, import and transit
- Forecasting gas balance
- Forecast of the development and reconstruction of gas production, transmission, underground storage and processing facilities
- Gas supply system development forecast
- Evaluation of industrial and environmental safety of gas industry facilities
- Drawing up proposals for normative and legislative base for successful implementation of gas industry development projects.

System analysis method

The interrelation of these targets conditions the necessity of their solution on the basis of methods of system analysis for complex objects. From the point of view of system analysis methodology gas industry is a complex object, which incorporates mineral-resource base and facilities for gas production, processing, transmission, storage, distribution and consumption. Each of such subsectors is also a complex subsystem. Thus, this chain will require its decomposition to a level, which will allow to describe an element with the help of appropriate models.

Gas industry both for the entire Latin America and its separate countries can be presented by a complex graph. The junctions of such a graph are as follows : promising gas-bearing regions, gas consumers, gas-processing facilities and gas storage systems. The arcs of the system are gas-transmission systems that allow marketing gas balances and gas flows. In other words, gas-transmission systems are a tool allowing to form balances and market appropriate gas flows.

Calculation of gas balances begins with the formation of prospective demand on the basis of forecasts of gas need in the domestic market and abroad. Since demand for gas is a probabilistic value, then pessimistic (lower level), realistic (mean level) and optimistic (upper level) demand scenarios are estimated with the help of methods of mathematical statistics and theory of relativity.

By analogy, to form an inflow part of balances, production capabilities for gas-bearing regions are preliminary calculated with evaluation of pessimistic, realistic and optimistic scenarios.

Inflow and outflow parts of balances determine the limits above in the graph junctions for subsequent solution of transmission problem. A tool for synchronizing the dynamics of consumption and production (including import and export) of gas are models of complex gas-transmission systems. Under the current limits in the system's junctions and maximum throughput capacity of gas pipeline sections optimization calculations of prospective gas flows are carried out for all scenarios of the development. Calculations are carried out for the entire gas-transmission system with allowance made for seasonal unevenness in gas consumption. Criterion of optimization varies depending on minimization of equivalent commodity-transporting work to a maximum net discounted profit under the conditions of maximum satisfaction of consumers with gas.

All this results in calculation of gas balance, forecast of consumption volume dynamics, required level of gas production (import), and required volumes of the development and reconstruction of gas-transmission system of a considered country in Latin America or the whole region.

Synchronization of calculations of volume indices makes it possible to make calculations of physical volumes of the development and reconstruction of facilities and requirements in material and technical resources based on dates of their development at a stage of further decomposition of separate subsystem of gas sector (including gas production, transmission, storage and processing). This approach allows switching to calculation of economic indicators of gas industry development and estimating consolidated economic indicators.

A final stage includes the analysis of risks for all considered scenarios of gas industry development and identification of necessary measures of the state support for mineral resources licensing, taxation and customs policy, pricing and industrial safety and environmental protection.

Practical implementation

The above theoretical approaches have been used in practice in the process of drawing up gas industry development Master Plan in Venezuela. The same programs are planned to develop for Bolivia and Peru.