

Integrated Investment Projects Performance Management

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Abstract — The paper reveals a comprehensive approach to economic efficiency assessment of large-scale investment projects in the energy sector. Authors consider scientific approaches to integrated assessment and substantiate its advantages when applying it to the assessment of effectiveness for the energy sector. At present, the accuracy of the estimates of the efficiency of investments in the energy sector is of particular importance in terms of the limited financial resources and the increasing capital intensity of deposit development. However, existing methods of determining investment efficiency for complex projects often tend to lead to incorrect results. The integrated assessment approach proposed in the article aims to overcome the shortcomings of existing approaches. Its peculiarity is to consider investment in a complex project as a single system consisting of subsystems - individual projects. The whole set of projects is classified according to the nature of the mutual influence, which makes the assessment process much easier. The implementation of an integrated approach requires special care in the performance evaluation and is possible in cases of simultaneous implementation of the projects included in the complex, aimed at achieving the same effects and having synchronized time frames of entry. The positive effect of increasing the accuracy of the assessment and, as a consequence, of significantly reducing the risk of economically unjustified investments, far exceeds the cost of making the evaluation procedure more complex under the developed method.

Keywords: efficiency management, cost-effectiveness, comprehensive project, system building projects, interdependent projects

I. INTRODUCTION

The production complexes of large oil and gas companies include technologically interconnected facilities related to various activities: extraction, transportation, storage, processing of hydrogen coal, liquified natural gas (LNG). At the same time, the current system of investment decision-making is characterized by multivariability across all activities. Accordingly, in order to synchronize decision-making and maximize profit, investment analysis must take into account the technological interrelationships of projects and consider the entire business chain. This approach is implemented through the concept of systemic economic efficiency, which involves an assessment of the interplay of the project and the company's business processes. Independent, alternative and integrated projects should be

identified to develop the concept of systemic efficiency with different methodical approaches to assessing the cost-effectiveness [8]. Fig. 1 presents the criteria for classifying a project as a specific type according to the degree of interconnection.

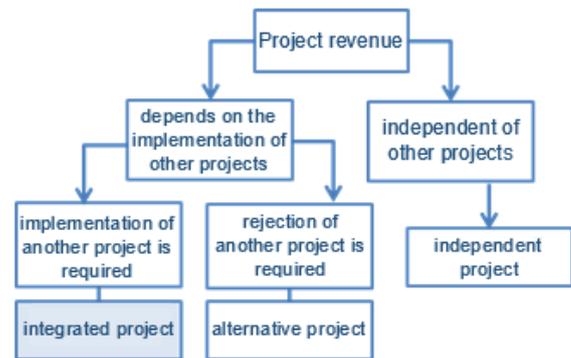


Fig. 1. Place of the integrated project in the context of the project revenue analysis. Source: compiled by the authors.

The projects with non-affecting the implementation and performance of other projects results may be considered independent. Example: construction of a LNG-plant and underground gas storage in different regions of the country.

Alternative projects imply achieving the same effects. An example of alternative projects is the choice of gas pipeline routes; decision on new construction or reconstruction of existing facilities.

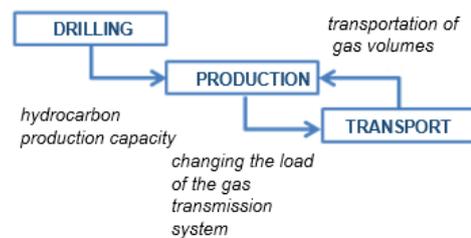


Fig. 2. Construction of a gas transportation infrastructure. Source: compiled by the authors.

In terms of this paper, a comprehensive investment project is considered, the revenue of which depends on the implementation of another project associated with it. A

comprehensive investment project consists of two or more projects, jointly aimed at achieving the same effects and having synchronized input dates. Thus, the construction of a gas transportation infrastructure is impractical without the timely development and development of the field (Fig. 2).

II. LITERATURE REVIEW

Evaluation of economic efficiency should be carried out simultaneously for all projects included in the complex and which are interconnected with each other. The relevance of the approach is determined by the fact that the results of the assessment for a separate project considered outside the complex may not meet the requirements of corporate profitability. However, at the same time, the profitable part of the complex project, which should be calculated based on real transaction prices, excluding internal prices and company tariffs, can meet all the necessary criteria.

Thus, the feasibility of including the project in the investment program of the company should be analyzed in terms of the relationship of the project with others. When financing complex projects, it is also necessary to focus on the work and the dynamics of capacity commissioning for other projects of the complex, which will make it possible to make the right investment decisions in a rapidly changing economic and political environment, as well as adjust development priorities.

The topic of economic efficiency assessment is actively discussed in the world scientific literature, but there is no single approach to integrated projects has been developed to date.

The main regulatory document for assessing the economic efficiency of projects examines the relationship between various projects and provides such concepts as independent, mutually exclusive, mutually complementary and mutually affecting projects. As an example, a gas field arrangement, a gas pipeline construction, an underground gas storage project, and a gas distribution network are complemented. A recommendation is given to evaluate the joint investment project as a whole, since in the implementation of individual projects the set goals cannot be achieved, and complementary projects can be accepted or rejected only at the same time.

A similar classification is presented in [5], where it is also noted that the implementation of projects is possible only simultaneously.

In A.F. Andreev's book [2], when classifying investment projects, there is a sign of "interdependence" that distinguishes independent, incompatible, mutually subordinate, competing and complementary projects. An example of mutually subordinated projects is the commissioning of an oil or gas field in a new area, which will depend on the construction of an oil and gas pipeline [2].

The approaches to the economic assessment of investment projects of the European Investment Bank, described in [20], suggest the need for a comprehensive assessment for infrastructure projects in the oil and gas industry (hydrocarbon transport, underground storage, liquefaction), which consists of the following steps:

1. determining the extent of the project and market research, including analysis of the need for

reconstruction of existing and construction of new infrastructure facilities;

2. making decisions on the implementation of additional infrastructure projects (underground gas storages, LNG-plants, processing facilities);
3. completion of a comprehensive project with a technical description.

In addition, it is recommended to consider the project from the point of view of various alternatives, including gas transportation routes; the use of materials for distribution networks; capacities of processing plants, LNG terminals and underground gas storages.

The article [14] raises issues of a comprehensive assessment of investment projects from the point of view of a rational choice of several alternatives. The authors propose to improve the efficiency of modernization of fixed assets at industrial enterprises to identify criteria for a comprehensive assessment of investment projects, with the help of which the ranking of the most relevant projects in a particular industry will be conducted. Approaches are examined using the pulp and paper industry as an example.

A number of foreign studies, such as [15, 16, 17, 18, 19], are also devoted to the problems of economic evaluation of projects in the oil and gas industry. In [19], complexity is considered as a necessary condition for long-term planning in the oil and gas industry. According to the authors, strategic decisions on the development of oil and gas fields should be taken simultaneously with the choice of transport system.

In articles by Russian authors Morozov A.V. [7], Khodkovskaya Y.V. [13], Ageeva O.A. [1], Taras A.N. [12], Wan C. [3], Rodyonova L.N. [11] economic evaluation of oil and A comprehensive approach to the assessment of the economic efficiency of oil and gas projects is particularly relevant in terms with the implementation of large system-forming projects. Problems of investment planning in the implementation of the East Siberian Oil and Gas Complex mega-project are raised in Articles [9] and [10]. Complex infrastructure and resource megaprojects are understood to mean "systemically organized complexes of investment projects of interrelated branches, located on vast territories, covering several subjects of the Federation, having national significance, high value and a significant number of participants" [10]. The goal of the mega-project formation, according to the authors, is "to achieve within the specified time-frame high economic efficiency of the inter-sectoral complex created both for the state and for all its participants, with high competitiveness of mega-project leaders in the world market" [10]. It is noted that it is important to develop common methodological approaches to strategic planning and management of megaprojects.

In article [4], the development of a methodology for assessing the systemic efficiency of gas industry projects is available. Along with such approaches as systemic, situational, dynamic, the authors need to take into account the complexity of project groups. This is understood as "joint consideration of project groups, providing common opportunities, in case it is impossible to obtain these benefits without the implementation of other group projects" [4].

Within the framework of this paper [6], it is proposed to introduce in the methodology of corporate technical and economic analysis of PJSC Gazprom the terms "consolidated calculation", "consolidated investment efficiency assessment" and "consolidated cash flow". The consolidated efficiency assessment assumes the formation of a cash flow across the entire facility's technological chain taking into account the consolidated costs for the entire complex of work in order to achieve the objectives of Gazprom. The approach of the consolidated efficiency assessment is considered in the case of the project of expansion of existing and construction of new capacity for transportation and processing of liquid hydrocarbons in the Nadym-Pur-Tazov region.

The analysis shows that there are a variety of specific and missing uniform approved methodological approaches to assessing the economic efficiency of complex projects. The methodology of consolidated calculations is most fully described in [6] by the example of a complex project that includes such activities as mining, transportation and processing.

To date, most of the projects in the oil and gas industry are complex and include the implementation of interrelated projects in the production, transportation of hydrocarbons, processing and liquefaction.

For example, PJSC NK Rosneft plans to build Far Eastern LNG with a capacity of 5 million tons per year, the reserves of the Sakhalin-1 consortium being the main resource. Implementation of the project involves not only the construction of an LNG plant, but also the seaport for shipping LNG and gas transmission infrastructure.

It is advisable to apply an integrated approach in the case when the objects included in the complex belong to different investors. The implementation of the East Siberia-Pacific Ocean pipeline system has made it possible to actively develop such oil fields as the Talakanskoye, Verkhnechonskoye, Danilovskoye, Markovskoye, Tersko-Kamovskoye, Duliminskoye, Yarakinskoye, West Ayanskoye, Srednebotuobinskoye, Taasnoe Taasu - Yuryakhskoe. In addition to the fields, the complex will also be supplemented by the Komsomolskoye oil refinery.

PJSC Gazprom implements complex projects in various types of activities: the construction of Baltic LNG is interconnected with the unified gas supply system of Russia; The Eastern Gas Program combines a complex of fields in Eastern Siberia and the Far East, the Power of Siberia gas transmission system and hydrocarbon processing facilities; the development of the Bovanenkovo field is impossible without the development of appropriate gas transmission capacities.

From the foregoing, we can conclude that facing a decrease in the target level of investment by oil and gas companies and strategic optimization of the asset portfolio, the relevance of an objective assessment of economic efficiency based on an integrated approach is increasing steadily.

III. RESEARCH METHODOLOGY

According to the principles of the existing methodology, the project includes only those income and expenses that are caused by its implementation. Moreover, for each investment

project, capital investments and operating costs are determined depending on the type of activity: production, transportation, underground storage, processing, LNG production, electricity generation. According to the types of investment projects, the revenue component is determined taking into account the set value of the internal rate of return (IRR).

Let us consider the approach to assessing economic efficiency using individual projects for the extraction and transportation of natural gas as an example.

To assess the economic efficiency of the production project, capital investments (CI) and operating costs (OC) associated with the production of natural gas are determined. The revenue side is determined based on the product of the volumes of gas produced by the price of its sale. If the project is economically inefficient, one of the possible methodological approaches is to determine the selling price based on the estimated capital and operating costs and a given corporate rate of return for production projects.

A similar situation exists in natural gas transport projects. To assess the cost-effectiveness of a transport project, CI and OC associated with this type of activity are determined. The volumes of transported natural gas are taken into account on the basis of those volumes that were obtained under an interconnected production project. Revenues are defined as the product of the tariff for gas transportation and goods transportation, determined on the basis of the volumes of natural gas (minus gas for own needs) and the length of the route. If the project is ineffective, it is possible to calculate the premium to the tariff, which, given CI and OC, will allow to reach the corporate rate of return defined for natural gas transport projects.

Accordingly, the indicators of economic efficiency obtained with the described approach (net income, net present value, undiscounted and discounted payback periods) do not reflect the economic efficiency of projects at current hydrocarbon prices, but show the necessary selling price or tariff to achieve corporate rates of return.

With this approach, in addition to the inability to reflect the current effectiveness of the project, the relationship between production and transport projects, the commissioning of capacities for which should be synchronized, is not taken into account. The analysis shows that for projects that make up a single complex, design estimates can in practice be developed separately, not taking into account the construction of technologically interconnected facilities. This, in turn, complicates investment planning and monitoring the implementation of complex projects. When determining the annual limits of financing for projects included in the complex, it is necessary to take into account the shifts in the terms of implementation for interrelated projects. To monitor the implementation of complex projects, it is often not enough to work with the financial and economic model for a single project and the formation of a comprehensive calculation is required. Based on the foregoing, we can consider the use of a different approach to assessing economic efficiency, based on the complexity of projects.

A comprehensive assessment involves the total accounting of capital investments and operating costs for

production and transport with the definition of a consolidated cash flow. The revenue component is determined based on current market selling prices and volumes of natural gas delivered to consumers. Performance indicators reflect the current market situation. When monitoring the implementation of a complex project, it is possible to take into account changes in the implementation schedule and the mutual influence of the facilities included in the complex.

IV. RESEARCH RESULT

An example of a complex on which the proposed approach has been tested is the field development project, the implementation of which is interconnected with the construction of the main gas pipeline. The complex calculation included the initial data on projects of various types of activity: drilling, production, transportation, communication. A comprehensive calculation requires the unification of the applied deflator indexes, price parameters, calculation horizon, and synchronization of power inputs. The market for the sale of final products for complex settlement plays a key role in determining performance indicators.

We will consider the proposed approach on an example. The complex project includes production and transport facilities. In the first version of the calculation, individual mining and transport projects are considered, the economic efficiency of which is estimated based on the profitability required by the investor (in the example, the value of 25% is taken). In the second version of the calculation, the assessment of economic efficiency is carried out by a comprehensive calculation. At the same time, the investor's profitability is not set, and the feasibility of investing is determined based on the price existing on the target market. The example of the target market is the Tyumen region, where the cost of natural gas is 3,296 rubles / thousand cubic meters according to the Federal antimonopoly service's Order of June 13, 2017 No. 776/17. The calculation results for a conditional example are presented in Table 1.

TABLE I. EFFECTIVENESS EVALUATION ON HYPOTHETICAL EXAMPLE

Name of indicator	Option 1		Option 2
	Output	Transportation	Total
Capital investments, million rubles	300 000	450 000	750 000
Total operating costs, million rubles	574 668	202 528	777 196
IRR,%	25	25	11,3
Cost of services, rubles / thousand cubic meters	3 700	5010,1	3 296

Source: compiled by the authors

As can be seen from Table 1, the calculation for option 1 does not reflect the real economic efficiency of the projects, but only shows the required price of natural gas / transportation services to achieve the investor's target profitability. If we consider the project as a single complex, then the yield is two times lower than that required by the investor. In addition, option 1 does not take into account the relationship between production and transport projects, which is important when changing the timing of

commissioning and monitoring the implementation of projects.

The calculation according to option 2 allows us to understand the economic efficiency of the complex project at the existing price of natural gas. Integrated accounting of capital and operating costs allows you to adjust the values of the other when changing the terms for one of the projects.

V. CONCLUSIONS

Given the current conditions, when the volatility of the markets is maximum and the conjuncture is not always favorable, the investor needs a qualitative technical and economic analysis and a full understanding of all project risks.

A drawback of the existing approach to the evaluation of individual projects in various types of activities is the lack of synchronization between objects included in a single technological complex, which does not allow an objective assessment of the economic efficiency of a complex project.

To take into account the mutual influence of projects, it is proposed to classify projects according to the degree of relationship to:

- independent;
- alternative;
- complex.

Assessment of complex projects is compounded by:

- difficulty in obtaining all the necessary initial information on the objects included in the complex;
- the need to unify price parameters, used deflator indices, and other macroeconomic information;
- taking into account all technological relationships between the facilities of the complex..

Nevertheless, the assessment of complex projects allows you to objectively assess the indicators of economic efficiency for systemically important large projects.

Determining the effectiveness of an integrated project requires a detailed analysis of the source data for all objects included in it. The results of such an analysis allow to evaluate the effect of all the factors considered on the performance indicators, as well as to propose the adjustment of indicators for the objects of various types of activity included in the complex. Thus, the reliability and validity of the results of the economic assessment of investments can be improved due to the proposed approach to complex projects.

This approach can be used to update the indicators of economic efficiency of projects in the oil and gas industry, monitor the implementation of complex projects, and make decisions on the inclusion of projects in the investment program of the company.

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