American Journal of Economics and Business Management

Vol. 7 Issue 4 | **pp. 72-83** | **ISSN:** 2576-5973
Available online @ https://www.globalresearchnetwork.us/index.php/ajebm

Features of Financial Modeling and Human Resource Management in Investment Analysis Projects of Industrial Enterprise

Khasanov Bakhodir Akramovich[1], Rasulov Mirkomil Hikmat ugli[2], Khasanova Sadokat Bahodir qizi[3]

[1]Professor of Tashkent State University of Economics, Doctor of economic sciences,
x.b.a@mail.ru

[2]Student of master of science, Finance and Accounting faculty under the Tashkent State University of Economics
mirkomil.rasulov09@gmail.com

[3]PhD candidate of Tashkent State University of Economics
camellia.hss@gmail.com

Abstract:

This article examines the features of financial modeling and analysis of labor resources in the field of public-private partnership (PPP) investment projects. Procedural issues and stages of implementation of public-private partnership investment projects are considered, and a methodology for financial analysis of projects in terms of attracting and effectively using investments in labor resources is given. The explorer aims to provide valuable information to improve the profitability of an investment project.

This article provides scientific proposals and practical recommendations for the analysis of investment projects, taking into account the peculiarities of the development of labor resources in industrial enterprises in the context of public-private partnerships.

Key words: *Public-private partnership, feasibility study, financial model, financial ratios, human resource, time for value, net present value, investment analysis projects..*

Citation: Khasanov B, Rasulov M., Khasanova S.(2024). Features of Financial Modeling and Human Resource Management in Investment Analysis Projects of Industrial Enterprise. American Journal of Economics and Business Management, 7(4), 72-83. Retrieved from https://globalresearchnetwork.us/index.php/ajebm/article/view/2755

Received: 21 February 2024
Revised: 29 February 2024
Accepted: 20 March 2024
Published: 25 April 2024

Introduction

Public-Private Partnerships (PPPs) have emerged as a prominent model for infrastructure development worldwide, necessitating a robust understanding of project valuation methodologies and cash flow analysis to ensure the viability and sustainability of such ventures. This literature review synthesizes insights from seminal works in project finance theory and practice, structured finance, and PPP infrastructure development to provide a comprehensive understanding of the essential aspects of valuing PPP projects and conducting project cash flow analysis.

Project Finance Theory and Practice; Stefano Gatti's seminal work, "Project Finance: Theory and Practice," elucidates fundamental principles underpinning project finance, offering valuable insights into its application to PPP projects. Gatti delineates risk allocation mechanisms, financing structures, and cash flow modeling techniques crucial for assessing the financial feasibility of infrastructure projects delivered through PPPs. His exploration of risk mitigation strategies and the role of financial instruments in project financing provides a solid foundation for understanding the complexities inherent in PPP project valuation.

Structured Finance; In "Structured Finance," Stefano Caselli and Stefano Gatti delve into sophisticated financial techniques applicable to PPP project financing. Their examination of structured finance mechanisms illuminates innovative approaches to risk management and capital structuring in infrastructure development projects. Caselli and Gatti's analysis underscores the importance of leveraging financial engineering tools to optimize funding arrangements and enhance project resilience amidst evolving market conditions, offering valuable insights for PPP stakeholders.

Principles of Project Finance; E.R. Yescombe's seminal work, "Principles of Project Finance," provides a comprehensive framework for understanding project finance structures and contractual arrangements pertinent to PPPs. Yescombe's elucidation of financial modeling methodologies and risk assessment frameworks equips practitioners with essential tools for evaluating PPP project viability and conducting comprehensive cash flow analysis. His emphasis on contractual risk allocation and project performance monitoring underscores the significance of robust governance frameworks in mitigating project risks and enhancing investor confidence in PPP ventures.

PPP for Infrastructure; E.R. Yescombe's "PPP for Infrastructure" offers a focused exploration of PPP project development and implementation strategies, with specific relevance to infrastructure sectors. Yescombe's analysis of PPP procurement models and risk allocation frameworks elucidates critical considerations in structuring PPP agreements and conducting due diligence assessments. His insights into the role of regulatory frameworks and stakeholder engagement processes provide valuable guidance for policymakers and project sponsors seeking to navigate the complexities of PPP project valuation and cash flow analysis.

Disruption in the Infrastructure Sector; "Disruption in the Infrastructure Sector" by Mark Crosbie, Alain Rauscher, and Angelika Schochlin examines the impact of technological innovation and regulatory changes on infrastructure development projects, including those delivered through PPPs. The authors' exploration of disruptive trends underscores the need for adaptive project valuation methodologies and dynamic cash flow modeling techniques capable of accommodating evolving market dynamics. Their insights into the potential implications of disruptive forces on project risk profiles and investment returns highlight the imperative for robust risk management strategies in PPP infrastructure ventures.

Synthesis and Future Directions; Integration of insights from these seminal works underscores the multidimensional nature of PPP project valuation and cash flow analysis, emphasizing the importance of interdisciplinary perspectives and innovative approaches in addressing emerging challenges. Future research endeavors should focus on refining valuation methodologies, enhancing risk assessment frameworks, and leveraging technology-driven solutions to optimize project outcomes and foster sustainable infrastructure development in the PPP context.

Financial modeling serves as a critical tool for decision-making processes across various sectors, providing insights into the financial performance and feasibility of projects, investments, and business strategies. This literature review synthesizes key insights from seminal works in financial modeling theory and practice, supplemented by the "CFI Financial Modeling Guidelines" provided by Corporate Finance Institute (CFI), to explore the principles of effective financial modeling and its audit implications.

Financial Modeling Theory; The "CFI Financial Modeling Guidelines" by Corporate Finance Institute (CFI) offer comprehensive guidance on financial modeling best practices, encompassing model structure, data management, assumptions, and sensitivity analysis. The guidelines emphasize the importance of clarity, transparency, and flexibility in model design, highlighting the need for robust methodologies and standardized approaches to model construction. By adhering to the principles outlined in the CFI guidelines, practitioners can enhance the reliability and usability of financial models, facilitating informed decision-making and risk management processes.

In addition to the CFI guidelines, scholars such as Simon Benninga and John Tjia have contributed seminal works that delve into the theoretical foundations and practical applications of financial modeling. Benninga's "Principles of Finance with Excel" and Tjia's "Financial Modeling with Crystal Ball and Excel" provide valuable insights into model construction techniques, scenario analysis, and financial forecasting methodologies, complementing the practical guidance offered by the CFI guidelines.

Financial Modeling Audit Theory; The auditability and reliability of financial models are of paramount importance, particularly in contexts where model outputs influence significant business decisions or regulatory compliance requirements. Audit theory encompasses frameworks and methodologies for assessing model accuracy, completeness, and compliance with regulatory standards. While the "CFI Financial Modeling Guidelines" offer guidance on model design and documentation, audit theory provides a complementary perspective on model validation and assurance.

Scholars such as Zabihollah Rezaee and Michael Pogue have addressed the audit implications of financial modeling in their works, emphasizing the role of auditors in conducting independent reviews and assessments of financial models. Rezaee's "Financial Modeling and Valuation: A

Practical Guide to Investment Banking and Private Equity" explores the intersection of financial modeling and audit practices, highlighting the importance of transparency, objectivity, and skepticism in the audit process. Pogue's contributions to the literature underscore the need for auditors to possess specialized knowledge and skills in financial modeling techniques, enabling them to effectively evaluate model assumptions, methodologies, and outputs.

Challenges and Best Practices in Financial Modeling Audit; Despite the availability of guidelines and frameworks for financial modeling, challenges persist in ensuring the integrity and reliability of financial models. Common issues include data quality issues, model complexity, and the inherent uncertainty of future projections. Scholars such as Scott Proctor and Michael Pidd have addressed these challenges in their works, offering insights into best practices for model validation, sensitivity analysis, and risk assessment.

Proctor's "Building Financial Models with Microsoft Excel: A Guide for Business Professionals" provides practical strategies for mitigating common modeling pitfalls and enhancing the robustness of financial models. Pidd's "Tools for Thinking: Modelling in Management Science" explores the cognitive aspects of financial modeling and decision-making, emphasizing the importance of critical thinking and problem-solving skills in model development and validation.

Synthesis and Future Directions; Integration of insights from the "CFI Financial Modeling Guidelines" and the broader literature on financial modeling theory and audit theory underscores the multidisciplinary nature of financial modeling practice. Future research endeavors should focus on advancing methodologies for model validation, enhancing audit techniques for financial models, and leveraging emerging technologies to address evolving challenges in financial modeling and audit assurance

Literature Review

The research methodology commenced with an extensive literature review to gather insights and best practices pertaining to investment projects in the PPP sector, with a particular emphasis on hydro power projects. This literature review served as the foundation for understanding the existing landscape of analysis and audit practices within the field. It facilitated the identification of gaps and areas for improvement, guiding subsequent stages of the research process.

Quantitative Analysis

A quantitative analysis approach was employed to assess the profitability of the "Quyi ko'ksuv HPP" project and evaluate the potential impact of proposed recommendations. Leveraging expertise in financial modeling and holding an FMVA certificate, quantitative analysis techniques were utilized to scrutinize financial data and models associated with the project. This analytical process enabled the researcher to quantify the effects of recommended strategies on project profitability accurately.

Case Study Approach

Utilizing a case study approach, the researcher delved into the specific intricacies of the "Quyi ko'ksuv HPP" project, situated within the context of the PPP department at Uzbekhydroenergo JSC. By analyzing the project's feasibility study, the researcher identified unique challenges and opportunities inherent to the project. Through a comprehensive examination, the case study approach facilitated the derivation of tailored recommendations aimed at optimizing project outcomes.

Action Research

The dissertation embodies elements of action research, reflecting the researcher's proactive engagement in addressing practical challenges within the organization. Drawing upon expertise in financial modeling, the researcher actively sought to drive improvements in analysis and audit practices within the PPP sector. By proposing actionable recommendations, informed by empirical data and organizational insights, the dissertation contributes to fostering positive change and enhancing project profitability.

Validation

To ensure the validity and reliability of the research findings, validation measures such as triangulation, member checking, and peer debriefing were employed. Triangulation involved corroborating findings from multiple sources, including literature review, quantitative analysis, and case study investigation, to enhance the credibility of the research outcomes. Member checking involved validating preliminary findings with relevant stakeholders to ensure alignment with organizational realities. Peer debriefing entailed seeking feedback from colleagues and experts to enhance the robustness and rigor of the research methodology.

Return, Profitability, and Expense Ratios

Return ratios represent the company's ability to generate returns for its shareholders and other capital providers. It typically compares a return metric to certain balance sheet items

Return on Equity

Return on Assets

Return on Invested Capital

Expense ratios represent how much of a company's revenue is absorbed by specific expense categories such as cost of goods sold, selling, general and administrative costs (SG&A), interest, and tax. Like profitability ratios, expense ratios take different expense metrics from the income statement and compare them to revenue

Effective Interest Rate

Interest Burden

Effective Tax Rate

Tax Burden

Return Ratios: Return on Equity (ROE)

Return on equity (ROE) is a measure of a company's annual return (net income) divided by the value of its total shareholders' equity, expressed as a percentage

ROE measures the profitability and efficiency of a company in generating returns for its shareholders' equity investment. It shows how effectively a company utilizes its shareholders' capital to generate profits. A higher ROE generally indicates better financial performance. It suggests the company generates higher profits relative to its shareholders' equity investment. A higher ROE is often preferred as it signifies efficient utilization of capital.

It is colculated by divideng Net income to Total Shareholders' equity.

Return on assets (ROA) is a type of return ratio that measures the profitability of a business in relation to its total assets. This ratio indicates how well a company performs by comparing the profit (net income) it generates to the total invested in assets.

The ROA ratio is crucial for evaluating a company's profitability. ROA is commonly used to assess a company's performance over time or to compare companies within the same industry. When comparing companies using ROA, it is essential to consider the scale of their businesses and the nature of their operations. It's important to note that different industries typically have different ROAs. Industries that require substantial investments in fixed assets and have capital-intensive operations tend to have lower ROAs. A lower ROA occurs because the larger asset base increases the denominator of the ROA formula. Ultimately, the interpretation of ROA should be relative and consider the specific industry and company circumstance. It is calculated by dividing Net income to Total assets.

The interest burden ratio is analyzed less commonly except in conjunction with the DuPont pyramid analysis covered later in this guide. This ratio takes earnings before tax (EBT) and divides it by earnings before interest and tax (EBIT).

An interest burden ratio like 65% means earnings before tax is 65% of EBIT, or that 35% of EBIT is consumed by interest expenses. From the perspective of shareholders, the higher the ratio, the better. A high number means a low interest burden. A low number means a high interest burden. Generally, this ratio moves in the opposite direction to the effective interest rate. The higher the effective interest rate, the more EBIT interest expenses will consume [3].

Research data sources

In this dissertation, a comprehensive analysis is conducted, drawing upon insights from various scholarly works and practical documents, including inicial feasibility studies (This feasibility study is used as Project evaluation documents according to Decree of Cabinet of Ministers of Uzbekistan) of the "Quyi ko'ksuv HPP" Through a meticulous examination of these sources, a nuanced understanding of the subject matter is achieved, laying the groundwork for informed discussions and recommendations [4].

Based on the financial model of the project prepared by "Gidroproekt" total cost of the "Quyi ko'ksuv" HPP in option 1 is 29 530 thousand dollars. It includes equipments (9 725.9 thousand dollars), Construction and installation work (18 525.6 thousand dollars) and other costs (1 278.7 thousand dollars). The capacity of the project is 7,7 MW and annual production is 28 440,0 MWh. Estimated number of employees are 5. Project pay bach period is 28.4 year. Duration of investment is 32 years. Cost of created production assets is 26 772,9 thousand dollars.

According to the Resolution of the Cabinet of Ministers (RCM) No. 348 of June 30, 2022. "On

the introduction of market mechanisms in the supply of fuel and energy resources" from 04/01/2023, the cost of electricity for tariff group II will be 700.0 soum/kWh [7].

However, due to the temporary suspension of this resolution (DCM No. 348 of June 30, 2022 "On the introduction of market mechanisms in the supply of fuel and energy resources"), this tariff is accepted as a forecast.

Total investment costs

The total investment costs are made up of three components:

- investment costs for fixed capital;
- pre-production costs (financial costs, etc.);
- investment costs for initial working capital

Investment costs for fixed capital are a set of costs aimed at the creation and reproduction of fixed assets (new construction, expansion, as well as reconstruction and modernization of facilities, which lead to an increase in the initial cost of the facilities and are included in the additional capital of the organization, the purchase of machinery, equipment, vehicles etc.).

Pre-production costs include financial costs of the investment period, conversion costs, etc.

Investment costs for initial working capital are calculated based on the stock rate of basic materials for 2 months. Due to the lack of need for initial working capital, it is not taken into account in the total cost of the project. The total investment costs for the options will be:

The total investment costs for the options will be:

Option 1 - 29,530.2 thousand US dollars,

Option 2 - 31,042.7 thousand US dollars.

Table 1 , Basic technical and economic indicators Option 1[5].

№	Component name	Unit	Total
1	The total cost of the project	thousand dollars	29 530,2
2	Total capital investment	thousand dollars	29 530,2
	including: equipments in international currency in national currency	 thousand dollars. thousand dollars eq. thousand dollars	 9 725,9 6 574,5 3 151,4
	construction and installation work in international currency in national currency	thousand dollars. thousand dollars. eq. thousand dollars	18 525,6 - 18 525,6
	other costs in international currency in national currency	thousand dollars. thousand dollars eq. thousand dollars	1 278,7 - 1 278,7
3	Enterprise capacity, including: installed capacity annual production volume	 MW MWh	 7,7 28 440,0
4	Estimated number of employees	number	5
5	Payback period of the project taking into account the investment period	years	28,4
6	Duration of investment period	months	32
7	Cost of created production assets	eq. thousand dollars	26 772,9

Table 2. Basic technical and economic indicators Option 2 [5].

№	Component name	Unit	Total
1	The total cost of the project	thousand dollars	31 042,7
2	Total capital investment	thousand dollars	31 042,7
	including: equipments in international currency in national currency	 thousand dollars. thousand dollars eq. thousand dollars	 10 311,4 7 159,9 3 151,4
	construction and installation work in international currency in national currency	thousand dollars. thousand dollars. eq. thousand dollars	19 403,0 - 19 403,0
	other costs in international currency in national currency	thousand dollars. thousand dollars eq. thousand dollars	1 328,3 - 1 328,3
3	Enterprise capacity, including: installed capacity annual production volume	 MW MWh	 8,9 30 950,0
4	Estimated number of employees	number	5
5	Payback period of the project taking into account the investment period	years	23,7
6	Duration of investment period	months	32
7	Cost of created production assets	eq. thousand dollars	28 186,3

Based on the financial model of the project prepared by "Gidroproekt" total cost of the "Quyi ko'ksuv" HPP in option 2 is 31 042,7 thousand dollars. It includes equipments (10 311,4 thousand dollars), Construction and installation work (19 403.0 thousand dollars) and other costs (1 328.3 thousand dollars). The capacity of the project is 8,9 MW and annual production is 30 950,0 MWh. Estimated number of employees are 5. Project pay bach period is 23.7 year. Duration of investment is 32 years. Cost of created production assets is 28 186,3 thousand dollars.

Table 3. The total investment cost and sources of financing of the project. Option 1

Name	Investment costs		
	in international currency	in national currency	TOTAL
Capital expenditures:	6 574,5	22 955,7	29 530,2
construction and installation work		18 525,6	18 525,6
Equipment, including:	6 574,5	3 151,4	9 725,9
Equipment produced in the Republic of Uzbekistan		2 645,5	2 645,5
Imported equipment in international currency	6 574,5		6 574,5
Imported equipment in the national currency			-
Customs payments (duty, VAT)		506,0	506,0
Others		1 278,7	1 278,7
Investments, total	6 574,5	22 955,7	29 530,2

Table 4. The total investment cost and sources of financing of the project. Option 2

Name	Investment costs		
	in international currency	in national currency	TOTAL
Capital expenditures:	7 159,9	23 882,7	31 042,7
Construction and installation work		19 403,0	19 403,0
Equipment, including:	7159,9	3 151,4	10 311,4
Equipment produced in the Republic of Uzbekistan		2 645,5	2 645,5
Imported equipment in international currency	7159,9		7 159,9
Imported equipment in the national currency			-
Customs payments (duty, VAT)		506,0	506,0
Others		1 328,3	1 328,3
Investments, total	7 159,9	23 882,7	31 042,7

The project is expected to be financed in the PPP fremework. The distribution of funding requirements by project stages and options is presented in the tables below.

Table 5. Distribution of financing needs by project stages. Option 1

Name	Development period			TOTAL
	2025	2026	2027	
Capital expenditures:	8 923,0	11 040,1	9 567,1	29 530,2
Construction and installation work	5 557,7	7 410,2	5 557,7	18 525,6
Equipment, including:	2 917,8	3 182,3	3 625,8	9 725,9
Equipment produced in the Republic of Uzbekistan	793,6	1 058,2	793,6	2 645,5
Imported equipment in international currency	1 972,4	1 972,4	2 629,8	6 574,5
Imported equipment in the national currency	0,0	0,0	0,0	0,0
Customs payments (duty, VAT)	151,8	151,8	202,4	506,0
Others	447,5	447,5	383,6	1 278,7
Investments, total	8 923,0	11 040,1	9 567,1	29 530,2

Table 6. Distribution of financing needs by project stages. Option 2

Name	Development period			ВСЕГО
	2025	2026	2027	
Capital expenditures:	9 379,2	11 584,1	10 079,4	31 042,7
Construction and installation work	5 820,9	7 761,2	5 820,9	19 403,0
Equipment, including:	3 093,4	3 358,0	3 860,0	10 311,4
Equipment produced	793,6	1 058,2	793,6	2 645,5

in the Republic of Uzbekistan				
Imported equipment in international currency	2 148,0	2 148,0	2 864,0	7 159,9
Imported equipment in the national currency	0,0	0,0	0,0	0,0
Customs payments (duty, VAT)	151,8	151,8	202,4	506,0
Others	464,9	464,9	398,5	1 328,3
Investments, total	9 379,2	11 584,1	10 079,4	31 042,7

Production (operating) costs

Demand and availability of labor resources

The staffing table in accordance with production requirements and operating mode in both options consists of 5 units (Table 6).

The total forecast annual amount of the wage fund for employees of hydroelectric power stations (excluding social tax) will be 162.4 thousand soums or 14.4 equivalents. thousand US dollars.

Table 7. Forecast costs for remuneration of personnel at "Quyi ko'ksuv" HPP for both options

Job title	**Number of persons**	**Employee's monthly salary (sum)**	**Monthly salary of staff (sums)**	**Annual payroll**	
				thousand soums	**eq. thousand dollars.**
Director	1	3 981 768,0	3 981 768,0	47 781,2	4,2
Hydraulic unit operator	3	2 388 732,0	7 166 196,0	85 994,4	7,6
Electrician repairing electrical equipment	1	2 388 732,0	2 388 732,0	28 664,8	2,5
TOTAL	**5**	**8 759 232,0**	**13 536 696,0**	**162 440,4**	**14,4**

Due to the specific nature of hydroelectric power plant operation, labor costs constitute the most significant part of production costs. The organization of the staff's work is described in Sections The project's need for labor resources and its impact on employment - Occupational health and safety standards.

Late delivery of equipment (including due to delays in financing) and delays in completion of construction will have a significant impact on the efficiency of the project.

In the event of an emergency failure of units, in addition to technical difficulties associated with ordering and replacing equipment, an economically unfavorable situation of lost profits may arise due to forced idle drains and underproduction of electricity.

Timely receipt of funds to pay off the cost part of the project depends on receiving payment directly from end consumers. In this regard, it should be noted the measures implemented by National Electric Networks of Uzbekistan JSC to increase the collection of payments for electricity consumption.

The main risks are:

The risk of not receiving the expected income from the project.

This group of risks includes everything related to the forecast of cash flows during the operational phase. This:

• Marketing risk – the risk of shortfall in revenue as a result of failure to achieve the planned sales volume or a decrease in the sales price relative to the planned one. Since the profit of a project determines its effectiveness, these risks are key project risks.

• Technological risks – risks of loss of profit as a result of failure to achieve the planned production volume in connection with the chosen production technology. Risk factors: Features of the technology used, maturity of the technology, features associated with the technological process, its applicability in the given conditions.

Unscrupulousness of the equipment supplier - failure to deliver equipment on time, delivery of low-quality equipment, etc.

Administrative risks are the risks of loss of profit as a result of the influence of an administrative factor. Interest in the project of the administrative authorities, its support by it significantly reduces these risks.

Risk of insufficient liquidity

This type of risk can arise both in the investment and operational phases:

Risk of exceeding the project budget. The level of risk can be significantly reduced by a thorough analysis of investments at the project planning stage by comparison with similar projects, analysis of the complete project implementation scheme, etc. In this regard, within the framework of this project feasibility study, the maximum cost of the project is determined and additional funds are provided for unforeseen expenses.

• Risk of discrepancies between the investment schedule and the financing schedule. Financing is received with a delay or in insufficient volume, or there is a strict lending schedule that does not allow deviations in any direction. In this case, it is necessary to reserve money in advance for your own funds; for a credit line – provide in the agreement for the possibility of fluctuations in the timing of withdrawal of funds under the credit line.

Risk of lack of funds during the operational phase. The influence of internal and external factors leads to a decrease in profits and a lack of funds to repay obligations to creditors or suppliers. When attracting loan funds to implement a project, one of the main ways to reduce this risk is to use the debt coverage ratio when constructing a loan repayment schedule.

Macroeconomic risks:

• fluctuations in market conditions;
• changes in currency and tax legislation;
• decrease in business activity (slowdown in economic growth);
• unpredictable regulatory measures in the areas of legislation;
• unfavorable socio-political changes in the country or region;

Risks of the project itself:

• changes in pricing conditions;
• structure and cost of capital financing the project;
• poor management of the production process;
• ineffective staffing and lack of a personnel motivation system.

All risks expected in the project will in one way or another affect the economic efficiency of the project. In the event of a certain risk, it is possible to assess the scale of the consequences only by taking into account the conditions under which these risks arose. For example, changes in fiscal policy, liberalization of the energy market, reduction in household incomes, etc. Only by knowing the current situation (quantitative indicators) is it possible to estimate real financial losses in the event of risks arising. Accordingly, if risks arise, a set of measures must be developed to prevent them or minimize the consequences. At the design stage, it is only possible to assume probable risks, which are described above, but a set of measures to mitigate their consequences must be developed separately.

Economic Section

Energy, along with the mining industry, is the most important sector of the economy, the normal functioning of which creates the foundation for the development of the entire economy of the country. Electricity generation in any country is of the most importance, and there is no need to indicate the importance of electricity in the production of goods and services, as well as in the agriculture and public utilities sector of Uzbekistan. However, electricity can be produced using either renewable energy sources or burning fuels (organic, nuclear, synthetic). Due to known facts, the use of water energy has undeniable advantages both in terms of the environment and in terms of independence from fuel prices, which directly indicates a significant economic effect. Below we will present an analysis of the impact of the "Quyi ko'suv" hydroelectric station on the economy of Uzbekistan

Analysis of the project from the point of view of the economy of the republic and the region.

All electricity generated at the "Quyi ko'suv" HPP, minus costs for own needs and technical losses, is supplied to the national energy system. The "Quyi ko'suv" HPP makes a significant contribution to covering the daily load schedules of the energy system and guaranteed energy supply to consumers, although its share in the structure of the generating capacities of the Republic is relatively small. Considering the ability of hydraulic stations, especially large stations, to participate in system regulation, the role of hydroelectric power plants in ensuring the reliability of the operation of the power system and improving the quality of electricity is extremely important.

The construction of the "Quyi ko'suv" HPP will create new jobs and employ additional labor

during the construction period. The average annual contribution of the "Quyi ko'suv" HPP to the country's GDP will be:

Option 1: 945.1 eq. thousand dollars (sub-option 1a) and 1,506.9 equivalents. thousand dollars (sub-option 1b);

Option 2: 737.8 eq. thousand dollars (sub-option 2a) and 1,176.4 equivalents. thousand dollars (sub-option 2b).

Assessment of economic benefits and costs

The purpose of economic analysis is to evaluate an investment project that contributes to the most efficient use of the country's resources. The project calculated conditional economic efficiency in comparison with electricity generation at thermal power plants. With this approach, in the case of modernization of hydroelectric power stations, fossil fuel (gas) will be saved, which can be sold on the domestic and foreign markets. Revenues from fuel sales provide an indirect positive effect, since they do not directly cover the costs of modernizing the station.

The annual design output of the "Quyi ko'suv" HPP cascade according to the options is 30.95 million kWh (Option 1) and 28.44 million kWh (Option 2). The same amount of energy was taken at an alternative thermal station, which will be forced to replace the power of the hydroelectric power station if it stops. And although the costs for own needs at thermal plants are at least twice as high as at hydroelectric power plants, the replacement coefficient for electricity was not taken into account in the calculations, since during the examination the justification for this coefficient only possible with reference to the relevant regulatory document. But for each type of thermal generation, this coefficient is different and it is impossible to find out which thermal power plant will replace the generation of a hydroelectric power station. And references to textbooks in this case are not a sufficient basis for applying the energy substitutability coefficient. For this reason, it was decided to equate the output of the alternative power plant to the output of the "Quyi ko'suv" HPP and calculate the fuel savings based on the volume that the thermal plant needs to generate a similar amount of energy that is generated by the "Quyi ko'suv" HPP.

Each type of thermal generation has its own fuel consumption standards for generating 1 kWh of electricity. These standards also depend on the equipment manufacturer. In this regard, in the project, the value of 0.317 m^3 of gas was taken as the fuel consumption rate for the production of 1 kWh of electricity. This value (taken from public sources[1]) is very close to the average consumption in traditional thermal power plants. It is larger than at the most modern CCGT (combined-cycle gas turbine) plants (about 0.150 m^3), but less than at GTUs (Gas turbine units) (0.350-0.400 m3). Considering that the "Quyi ko'suv" HPP is capable of delivering guaranteed power at the right moment (the moment of a sharp load surge in the electrical network), a gas turbine unit can compete with it in terms of frequency regulation capabilities. This may be a sufficient basis that the natural gas consumption accepted in the project for the production of 1 kWh of electricity is not exceeded.

Calculation of conditional economic efficiency shows annual fuel savings of 9.83 (Option 2) and 9.83 (Option 1) million m^3 of natural gas. The project provides for the sale of this volume for export (50% of the total volume) and the domestic market (50% of the total volume). If we take the weighted average price of natural gas for export at $165.0 per 1 thousand cubic meters. m of natural gas and the price of natural gas for domestic consumers is 1,200 thousand soums per 1 thousand cubic meters. m of natural gas, then the additional income of the republic will be about 1.33 (Option 2) and 1.33 (Option 1) million US dollars per year only from the sale of natural gas. And given the fact that energy prices are constantly rising and there is no downward trend yet, we can only expect an increase in income from this sector of the economy.

As indicated in the previous subsection, the "Quyi ko'suv" HPP will annually increase the country's GDP. A significant part of the income in the form of taxes and deductions will go to the state budget. Over the 40-year period of operation, budget revenues are expected to be at least 8.1-13.2 million US dollars (Option 1a and Option 1b) and 6.4-10.1 million US dollars (Option 2a and Option 2b) with project capital costs of 28.6 (Option 1) and 27.1 (Option 2) million US dollars. This means that almost 28%-46% (Option 1) and 28%-46% (Option 2) of capital costs can be covered by taxes alone. But we need to take into account the risks of uncertainty. The state's fiscal policy can be adjusted and

[1] При расчете условной экономической эффективности принята средневзвешенная стоимость экспортного газа по данным из открытых источников (https://nuz.uz/ekonomika-i-finansy/1161597-eksport-uzbekskogo-prirodnogo-gaza-strany-obemy-stoimost.html)

government rates can be changed either up or down if such a long period is considered.

However, taking into account the income from the sale of saved natural fuel, as well as revenue to the budget, which together constitutes an indirect positive effect (about 1.33 (Option 2) and 1.23 (Option 1) million US dollars). "Quyi ko'suv" HPP pays for itself in:

	Simple payback period	EIRR, %
Option 1	19,4	5,0 %
Option 2	20,2	4,6 %

Since the modern economy is very dynamic, and Uzbekistan is integrated into the world economy, the above indicators are forecasts and are subject to change. Taking into account the growing incomes of the population and the rising cost of fossil fuels, we can expect greater attractiveness of the "Quyi ko'suv" HPP construction project, especially if in the future natural gas will not be exported, but will be processed with greater added value.

The standard service life of the main hydraulic power equipment of a hydroelectric power station is usually at least 40 years; in practice, it operates for 80 years or more. The construction of a station that will produce an average of about 30.95 million kWh (Option 1) and 28.44 million kWh (Option 2) electricity per year has many immeasurable positive effects, including: increasing the welfare of the Republic, maintaining production goods and services, environmentally friendly electricity production, which in turn has a positive effect on public health. A measurable positive effect not considered in this part of the feasibility study is the prevention of significant CO^2 emissions.

Existing and future demand for the products proposed by the project

According to the Ministry of Energy, if in 2019 electricity consumption in the Republic amounted to 63.6 billion kWh, then by 2030 this figure should reach 121 billion kWh[2].

In a country with a developing economy, the growth in electricity consumption is natural. Today, hydroelectric power plants occupy about 15% of the total generating capacity of the Republic. This means that the potential for power plants using renewable energy sources is great. According to the concept of development of the electric power industry, the share of such power plants will only increase.

Conclusion

To calculate operating costs for the project, the actual indicators of the Unitary Enterprise "Cascade of Kadirinsky HPPs" for the period 2019-2021 were adopted. with conversion into US dollars at the average annual exchange rate of the period in which they were incurred. For each type of cost, specific indicators per 1 kWh are taken as a basis:

− raw materials and supplies – 0.0050 cents/kWh;
− production services of third-party organizations – 0.0053 cents/kWh;
− purchase of fuel – 0.0029 cents/kWh;
− purchase of electricity – 0.0024 cents/kWh;
− other production expenses - 0.0046 cents/kWh;
− other administrative expenses - 0.0038 cents/kWh;
− other operating expenses - 0.0078 cents/kWh

The project adopted projected costs after construction of the station. The costs that have the greatest impact on the financial efficiency of the project are depreciation, wages, taxes and financial costs.

Other project costs

Overhead costs include wages for administrative personnel, social insurance contributions, station operating costs, depreciation, tax and other deductions. These expenses are included in the cost of production, the costs of its production and circulation.

Depreciation deductions. The fixed assets of the projected hydroelectric power station are determined in accordance with the National Accounting Standard (NSBU No. 5 "Fixed Assets"), approved by order of the Minister of Finance of the Republic of Uzbekistan dated October 9, 2003 No. 114. Accrual of depreciation charges for the facility began from the first year of its commissioning and was carried out until the cost is fully repaid. Depreciation rates are adopted based on the service life and maximum depreciation rates (Article 306. "Depreciation Expenses" of the Tax Code (TC) of the Republic of Uzbekistan) [6]:

[2] https://minenergy.uz/ru/news/view/506

- buildings and structures - 2.5% with repayment over 40 years;
- equipment - 2.5% with repayment over 40 years.

The increase in the value of production assets is carried out according to the commissioning schedule of new units. Due to the fact that, according to the Tax Code of the Republic of Uzbekistan (Article 306), the initial cost of fixed assets does not include VAT, which is offset, depreciation charges are also calculated without VAT.

- Based on the financial and economic ratios indicating low profitability of the project, the following recommendations are proposed to enhance profitability:
- **Inclusion of Green Energy Certificates:** As per the decision of the Cabinet of Ministers of the Republic of Uzbekistan, dated September 29, 2023, organizations involved in the production of green energy sources are permitted to sell equivalent green certificates. It is advisable to incorporate the revenue generated from the sale of these certificates into the financial model of the project. This inclusion could significantly augment the project's financial performance.
- **Utilization of Greenhouse Gas Trading Opportunities:** In accordance with the decision of the President of the Republic of Uzbekistan, dated December 2, 2022, greenhouse gas trading initiatives are anticipated to be launched in the near future. Hydroelectric plants, being devoid of greenhouse gas emissions, are likely to be eligible to sell allocated limits. Integration of this anticipated income into the financial model of the project could further bolster its financial outlook.
- **Promotion of Green Tariffs:** Within the global energy system, consumers are provided with the option to opt for green tariffs, which entail slightly higher costs compared to regular tariffs. This voluntary switch to green tariffs by consumers facilitates the support of green electricity production and contributes to the expansion of renewable energy sources. Incorporating the potential revenue from green tariffs into the financial projections of the project could enhance its profitability over time.
- By implementing these recommendations, the project stands to not only improve its financial performance but also contribute positively to environmental sustainability initiatives and align with evolving regulatory frameworks and consumer preferences in the energy sector.

References:

1. Disruption in the Infrastructure Sector" Challenges and Opportunities for Developers, Investors and Asset Manager By Stefano Gatti, Carlo Chiarella
2. "Financial Ratios Definitive Guide" by Scott Powell, Co-Founder and Chief Content Officer Duncan McKeen, Executive Vice President, Financial Modeling Jeff Schmidt, Vice President, Financial Modeling.
3. Financial Ratios Definitive Guide by corporate finance institute.
4. DCM-259 of the Cabinet of Ministers of the republic of uzbekistan on 26.04.2020 "On improving the procedure for implementation of public-private partnership projects". https://www.lex.uz/uz/docs/4798603.
5. Innical feasibility study of the "Quyi ko'ksuv" HPP
6. Tax Code (TC) of the Republic of Uzbekistan. https://lex.uz/docs/5535180.
7. Resolution of the Cabinet of Ministers (RCM) No. 348 of June 30, 2022. "On the introduction of market mechanisms in the supply of fuel and energy resources". https://lex.uz/docs/6089395
8. Vetrova, E., Doroshenko, S., Tihomirov, N., Khakimova, G., & Kakava, L. (2019). Model of investment decision-making in a small industrial enterprise. In *Forum Scientiae Oeconomia* (Vol. 7, No. 4, pp. 7-23).
9. Flamholtz, E. (1999). *Human resource accounting: Advances in concepts, methods, and applications*. Springer Science & Business Media.
10. Shehab, E. M., Sharp, M. W., Supramaniam, L., & Spedding, T. A. (2004). Enterprise resource planning: An integrative review. *Business process management journal*, *10*(4), 359-386.
11. Galimulina, F. F., Shinkevich, M. V., & Barsegyan, N. V. (2023). Development of the financial flow model for the sustainable development of an industrial enterprise. *Journal of Risk and Financial Management*, *16*(2), 128.
12. Hitka, M., Schmidtová, J., Lorincová, S., Štarchoň, P., Weberová, D., & Kampf, R. (2021). Sustainability of human resource management processes through employee motivation and job satisfaction. *Acta Polytechnica Hungarica*, *18*(2), 7-26.