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Analysis of Financial Efficiency of Renewable Energy Projects Through a Value-Based Management Approach

Maya Matofani[1], Sri Hartati[2], Devia Septyani[3]
Politeknik Akamigas Palembang, Indonesia
Email: maya@pap.ac.id[1], sri_hartati@pap.ac.id[2], devia@pap.ac.id[3]

Abstract

This study explores the application of the Value-Based Management (VBM) approach in analyzing the financial efficiency of renewable energy projects. As the global demand for clean and sustainable energy increases, renewable energy projects play a strategic role in the energy transition but are often faced with challenges of large initial investment, technological risks, and regulatory uncertainty. The results show that the application of VBM in evaluating renewable energy projects can improve the quality of investment decision making by considering both financial and non-financial aspects holistically. VBM encourages companies to be more selective and strategic in choosing projects that are not only economically feasible, but also socially and environmentally sustainable. In addition, this approach provides a strong framework for aligning managerial objectives with shareholder interests, improving corporate governance, and strengthening transparency in the process of evaluating and reporting project performance.

Keywords *value-based management; financial efficiency; renewable energy; investment decision making, strategic management.*

INTRODUCTION

The changing global energy landscape in recent decades has placed renewable energy as one of the main pillars in the effort towards sustainable development. Pressure on countries to reduce carbon emissions and dependence on fossil fuels is increasing as awareness of the climate crisis that is currently hitting the world grows. Amid this transition, renewable energy projects such as solar, wind, biomass, and small hydro are becoming increasingly important, not only as a source of clean energy but also as a strategic investment for the future of the economy (Value-Creation Efficiency as a Decision-Making Basis and Its Assessment in the Financial Management of Energy Companies: Evidence from the Polish Capital Market, n.d.). However, in their implementation, these projects often face challenges related to financial efficiency that have the potential to affect their long-term sustainability. Renewable energy projects, although promising significant environmental benefits, often require large initial investments and long payback periods (Pirozzi et al., 2023). This requires careful financial management so that the project is not only technically feasible but also financially profitable. This is where the need arises to implement a management approach that is able to maximize value for shareholders and other stakeholders, one of which is Value-Based Management (VBM). VBM is a managerial framework that is oriented towards creating long-term value by balancing investment, operational, and financial decisions. This approach is increasingly relevant in the context of renewable energy which is full of dynamics and risks.

In practice, the analysis of the financial efficiency of renewable energy projects still often uses conventional indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period. Although these indicators provide an important quantitative

picture, this approach does not fully reflect the creation of sustainable value in the long term. Value-Based Management is present as a more comprehensive approach with a focus on economic value added (EVA) and more strategic risk management (Malmi & Ikäheimo, 2003). In other words, VBM not only evaluates financial performance alone, but also places shareholder value as the main benchmark in making business decisions.

The application of VBM in the renewable energy sector can also help overcome the uncertainties inherent in these projects, such as energy price fluctuations, changes in government policies, and the development of new technologies. Through this approach, companies can design more adaptive investment strategies, manage working capital more efficiently, and increase transparency in financial performance reporting. In addition, VBM encourages greater accountability at all levels of management, which in turn can increase investor confidence in renewable energy projects (Dranka et al., 2020). Indonesia as a developing country with abundant renewable energy potential, such as hydropower, geothermal, and bioenergy, has its own challenges in developing this sector. The Indonesian government has set a target for a new renewable energy mix of 23% by 2025, but to date the realization of the achievement is still far from the target. One of the main obstacles is limited financing caused by the low perception of investment risk in this sector. Therefore, a study on VBM-based financial efficiency analysis is very important to provide new insights in increasing investment attractiveness while supporting the achievement of national renewable energy targets.

Furthermore, the transformation towards clean energy also demands reform in the financial management paradigm of energy companies. In this context, VBM is not only relevant for large companies, but is also important to be applied to medium and small-scale projects that are the backbone of renewable energy development in various regions. The use of VBM allows business actors to focus more on creating real value, both in the form of profit and social and environmental contributions, so that renewable energy projects can become a driving force for inclusive green economic growth (Uvarova et al., 2023).

In addition, the relevance of VBM in renewable energy projects is increasingly evident when faced with fierce global competition. Developed countries have already adopted incentive systems and fiscal policies that support the acceleration of investment in this sector. If Indonesia does not immediately implement a more effective financial management framework, the opportunity to become a major player in the world's clean energy supply chain could be missed. Therefore, the implementation of VBM can be a strategic key in building competitive advantages, both regionally and internationally (Ye et al., 2023).

Another aspect that is no less important is the involvement of financial institutions in supporting the financing of renewable energy projects. With the VBM framework, these projects can increase their credibility in the eyes of institutional investors, such as banks, insurance companies, and pension funds, which are generally more selective in assessing the risks and potential returns of investments. This is in line with the global trend that shows an increase in the allocation of investment funds to instruments oriented to Environmental, Social, and Governance (ESG) (Nowotny et al., 2022). Thus, the application of VBM is not

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only theoretically relevant but also has the potential to open access to broader and more sustainable funding sources.

At the policy level, studies on VBM-based financial efficiency can also provide input for the government in designing more targeted regulations and incentives (Nejatyan et al., 2023). By understanding how value is created and risk is managed in renewable energy projects, the government can encourage policies that minimize investment barriers, such as complicated licensing, electricity price uncertainty, and unstable rules of the game. Policy reforms that are in line with VBM principles are expected to create a conducive investment ecosystem, which ultimately accelerates the national energy transformation.

With this background, this study aims to analyze the financial efficiency of renewable energy projects in Indonesia using the Value-Based Management approach. It is expected that the results of this study can provide theoretical contributions in the development of modern financial management concepts in the energy sector and provide practical recommendations for stakeholders, including investors, governments, and project developers, in designing more effective policies and strategies in managing renewable energy projects. This effort will ultimately support the sustainable development agenda that is being echoed globally, while also answering the challenges of increasing energy needs in the future.

METHOD

The research method used in this study is a literature review with a descriptive-analytical approach. This study is based on an in-depth review of various relevant literature sources, both in the form of scientific journals, research reports, reference books, and policy documents related to financial efficiency, renewable energy, and the implementation of Value-Based Management (VBM). The data collection process was carried out through a systematic search in leading academic databases such as Scopus, Web of Science, and Google Scholar, with keywords adjusted to ensure a comprehensive and up-to-date study coverage.

Furthermore, data obtained from various literatures were analyzed using content analysis techniques to identify patterns, concepts, and key findings related to the financial efficiency of renewable energy projects. In this stage, special attention is paid to studies that examine the use of VBM in the context of the energy industry, as well as the experiences of other countries in implementing a value management approach in energy infrastructure projects. This analysis aims to compile a comprehensive synthesis, which not only describes the current conditions, but also offers insight into the potential for implementing VBM in Indonesia.

As part of the literature review, this study also compares various models and indicators used to measure financial efficiency in energy projects. Through this comparative approach, the study seeks to evaluate the extent to which the VBM approach can complement or even replace conventional methods such as NPV and IRR. Thus, the results of this literature review method are expected to provide a strong theoretical basis for the

development of a more relevant financial evaluation framework for the renewable energy sector in Indonesia.

RESULTS AND DISCUSSION

Definition of Value-Based Management and its Relevance in Corporate/Project Financial Management

Value-Based Management (VBM) is a management approach that places value creation for shareholders as the primary objective of all company activities. This concept was born from the understanding that the primary objective of a company is not merely to generate short-term profits, but to increase its economic value sustainably. VBM emphasizes the importance of decision-making that always refers to its impact on the company's value (Ahonen, 2025). In other words, every strategy, investment, operation, or daily activity must be evaluated based on how much it contributes to adding value to capital owners. In the context of financial theory, VBM is closely related to the concept of economic value added (EVA) and discounted cash flow (DCF). Both of these approaches emphasize the importance of efficient and optimal capital management so that the company is able to generate profits higher than its cost of capital. This means that a new company truly creates value if the returns generated from its projects or operational activities exceed the minimum rate of return expected by investors or creditors. With this approach, VBM helps align the interests of managers with shareholders, because managerial performance is not measured only by revenue growth or asset expansion, but by the ability to create real added value.

In corporate financial management practices, the relevance of VBM is increasingly evident amidst the dynamics of a competitive business environment (Burcă et al., 2024). Companies that consistently implement VBM will have a clearer framework in formulating financial strategies, designing capital structures, and assessing investment feasibility. For example, in making investment decisions, companies that adopt the VBM principle do not solely look at the potential nominal profit, but rather at the net present value generated by the project after deducting its capital costs. This ensures that every project that is carried out actually contributes to increasing the value of the company, not just increasing business volume without adequate returns.

In addition, in project management, VBM also provides important guidance for project managers to focus on creating value throughout the project life cycle. By adopting this approach, the assessment of project success is not only seen from the timeliness and budget, but also from how much the project increases value for the company's stakeholders. VBM helps ensure that every stage of project planning, implementation, and evaluation is always linked to value-added benchmarks. This approach also demands greater transparency and accountability, as all decisions taken must be financially justified based on their contribution to the company's value.

On a broader scale, VBM also helps companies build a corporate culture that is oriented towards creating long-term value. By making shareholder value the main compass, companies are encouraged not to get caught up in managerial practices that only pursue short-term profits, which often sacrifice business sustainability. On the other hand, VBM

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encourages more careful risk management, because each risk must be analyzed for its impact on the company's overall value. In other words, this approach builds stronger managerial discipline in managing financial resources and investments.

According to (Frey et al., 2024) the relevance of VBM is also increasingly prominent in the current era of globalization and digitalization, where companies are required to be more adaptive but still maintain focus on the main goal of creating value. In the face of global competition, pressure from the capital market, and increasingly high investor expectations, the implementation of VBM is a strategic tool to maintain competitiveness while ensuring the company's financial sustainability. With the VBM framework, companies can develop strategies that are not only responsive to changes in the business environment but also remain controlled in maintaining the growth of their economic value (Gough, 2022). Thus, Value-Based Management is not just a theoretical concept, but a managerial practice that is very relevant in the management of corporate finance and projects. It is an effective guide to ensure that every decision taken, both at the strategic and operational levels, is always oriented towards creating added value for shareholders. In a changing business landscape, the disciplined application of VBM will help companies achieve sustainable growth while increasing investor confidence in their future prospects.

The Role of Value-Based Management Approach in Investment Decision Making

The Value-Based Management (VBM) approach is a managerial framework that places value creation for shareholders as the main objective of all company activities, including in the investment decision-making process (Wobst et al., 2023). In practice, VBM is not only a business philosophy, but also a strategic tool that aligns the interests of management, employees, and shareholders through measurable value parameters. In the context of investment decision-making, VBM plays an important role because it provides a consistent evaluation basis for assessing each investment opportunity, ensuring that the decisions taken actually increase the company's value in the long term. The application of VBM in investment decisions begins with a shift in the managerial paradigm from focusing solely on revenue growth or market share, to focusing primarily on the creation of real economic value ('VALUE-BASED MANAGEMENT', 2021). In the traditional approach, many investment decisions are only measured from the accounting side, such as net income or short-term cash flow. In contrast, VBM uses indicators such as Economic Value Added (EVA) or Cash Flow Return on Investment (CFROI) which better reflect the increase in shareholder wealth in real terms. Using these measures, each investment under consideration is evaluated based on its ability to generate returns in excess of the company's cost of capital. This is important because only investments that create a surplus over the cost of capital theoretically add value to shareholders.

In the process, the VBM approach encourages management to be more selective in assessing the risks and potential returns of each investment project. Each decision must go through a rigorous analysis process, where future cash flow projections, inherent risks, and the cost of capital must be realistically calculated. This helps avoid decisions driven by short-term ambitions or non-economic considerations that are not aligned with shareholder

interests. Thus, VBM helps build a higher investment discipline, where only projects with a positive net present value (NPV) are worth pursuing (Gaponenko et al., 2021).

In addition to providing an objective evaluation framework, VBM also plays a critical role in aligning incentives across the organization (Mavropulo et al., 2021). When companies adopt VBM comprehensively, value-based financial performance indicators will be used as the basis for managerial and employee compensation systems. In other words, investment decisions that successfully increase the value of the company will have a direct impact on the financial rewards received by management. This mechanism encourages managers to be more careful and responsible in making investment decisions, because the success or failure of the project will have real consequences for their personal position. With this incentive alignment, VBM helps create an organizational culture that focuses on long-term value rather than achieving short-term targets that do not necessarily create value. Another role of the VBM approach in investment decision making lies in its ability to encourage greater transparency and accountability. With performance measures based on value creation, stakeholders, including investors, creditors, and financial analysts, can more easily assess whether the investment decisions taken by the company are actually leading to value growth. This increases market confidence in the company, which in turn can lower the cost of capital and provide greater access to financing sources. This transparency also becomes an effective control tool for the board of directors in supervising management's strategic decisions.

Factors Affecting the Financial Efficiency of Renewable Energy Projects

Factors affecting financial efficiency in renewable energy projects are becoming a strategic issue that is receiving increasing attention, along with the increasing global investment in this sector. Financial efficiency, in this context, refers to a project's ability to optimally manage financial resources to achieve clean energy targets at competitive costs. The complexity of renewable energy projects, such as solar, wind, bioenergy, and hydropower plants, makes the factors affecting their efficiency multi-layered, covering technical, economic, policy, and social aspects (Dong et al., 2022).

One of the main factors that plays a major role is the financing structure of the project itself. Renewable energy projects generally require a fairly large initial investment, while the financial benefits are only felt in the medium to long term (Zhang et al., 2022). Therefore, the availability of affordable and flexible financing schemes is very important. Instruments such as low-interest loans, green bonds, and financing support from multilateral financial institutions are often catalysts in increasing financial efficiency. In addition, the existence of government guarantees or clear power purchase agreement (PPA) schemes will increase investor confidence, so that financial risks can be minimized.

Financial efficiency is also influenced by the dynamics of the cost of the technology used. In recent decades, the cost of solar panel and wind turbine technologies has decreased significantly due to the increasing scale of production and advances in manufacturing processes (Mukhtarov et al., 2022). However, renewable energy projects remain highly sensitive to price fluctuations of these technology components, especially if there is a

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disruption in the global supply chain. Therefore, stable access to technology at competitive prices is an important requirement to keep capital costs within reasonable limits. On the other hand, government policies play a central role in determining the financial efficiency of projects. Competitive renewable energy electricity tariff policies, tax incentives, and ease of licensing will directly affect the cost and revenue structure of the project. In countries with regulations that support the energy transition, renewable energy projects tend to have lower financial risks, thus attracting more private funding. Conversely, policy uncertainty or sudden regulatory changes can increase the cost burden, because investors will include these risks in calculating the cost of capital.

In addition to policy aspects, geographical factors and natural conditions also cannot be ignored. The potential of energy sources, such as sunlight intensity, wind speed, or water discharge, greatly determine the electricity production capacity of a project. Financial efficiency will be optimal if the project is built in a location with abundant and stable energy sources. Conversely, development in areas with fluctuating energy sources will increase operational costs because of the need for an energy storage system or backup from other sources. Furthermore, project management factors and internal financial governance also play a key role. Projects that are managed with careful planning, strict budget supervision, and the use of efficient management technology tend to have lower cost overruns. The experience and managerial capabilities of project developers are also often the differentiators between financially efficient projects and those that experience losses or cash flow difficulties. Social aspects and local community acceptance also affect the smooth implementation of the project, which ultimately has an impact on financial efficiency. Projects that receive support from the community tend to face fewer social or legal obstacles, so construction times can be shorter and additional costs can be avoided. In some cases, social conflicts due to lack of public consultation actually cause significant delays and cost increases (Fatima et al., 2021). Equally important, the development of the energy market and the selling price of electricity in the free market also determine the level of financial return on the project. If the price of electricity from fossil fuels is still much cheaper than renewable energy, then clean energy projects will experience financial pressure, unless there are subsidies or other incentive schemes that bridge the cost gap. However, global trends show that along with increasing carbon prices and strengthening environmental policies, the price competitiveness of renewable energy continues to increase. In recent years, the adoption of digital technology and smart grids has also begun to play a role in increasing financial efficiency. The use of real-time monitoring systems, predictive maintenance, and smarter load management allows projects to reduce downtime, increase operational efficiency, and ultimately lower the cost per unit of electricity generated.

Ultimately, the financial efficiency of renewable energy projects is the result of synergy between many factors, both internal and external. The success of a project is not only determined by the sophistication of the technology chosen, but also by the accuracy of financial planning, the accuracy in reading market dynamics, and the ability to adapt to changes in regulations and social conditions. In other words, financial efficiency in

renewable energy projects is a reflection of effective risk management in a complex and ever-evolving ecosystem.

Furthermore, political risk factors and macroeconomic stability of a country also have a significant impact on the financial efficiency of renewable energy projects. In countries experiencing political uncertainty, such as frequent changes in leadership or policy conflicts between ministries, project risks automatically increase. This condition encourages financial institutions and investors to charge higher risk premiums which are then reflected in high funding costs. In addition, high inflation or volatility in the local currency exchange rate against the US dollar which is usually used in renewable energy technology transactions can also affect the cost of importing equipment and raw materials, thus disrupting project budget calculations.

The renewable energy sector is also closely related to the development of the national electricity infrastructure network. The financial efficiency of a project can be eroded if the electricity transmission network is not ready or requires large additional investments to connect the project site to the energy demand center. This often happens in developing countries, where the locations with the greatest solar or wind energy potential are in remote areas far from the main electricity grid. As a result, the cost of building supporting infrastructure, such as transmission networks and substations, must be borne by the project itself, which ultimately burdens the overall financial structure. In addition to infrastructure, regulations related to access and electricity network usage rates, known as wheeling charges, are also key determinants in calculating financial efficiency. If the cost of transmitting electricity from the generator to the end user is too high, then the profit margin will shrink. Therefore, countries that have transparent open access regulations and reasonable transmission costs are usually more attractive to renewable energy project developers. Furthermore, the readiness of human resources (HR) cannot be ignored. The availability of local workers who are skilled in renewable energy technologies can reduce training costs and reduce the need to bring in foreign workers who are more expensive. Projects that are able to build local capacity from the early stages tend to have lower operating and maintenance costs in the long term. On the other hand, the lack of local expertise often leads to dependence on international contractors who charge premium rates, which directly impacts the financial efficiency of the project.

The next important factor that is increasingly receiving attention is access to accurate data and information in the project planning stage (Rasoulinezhad & Taghizadeh-Hesary, 2022). Feasibility studies based on complete and reliable historical data can reduce the risk of inaccurate estimates, which are often the main cause of cost overruns. The use of modern software-based energy simulations allows for more precise projections of electricity production, so that financial plans can be prepared more realistically. Lack of quality data often leads to overly optimistic or pessimistic assumptions, which ultimately disrupt cash flow stability and returns on investment.

No less interesting is the role of financial institutions and banks that have begun to adopt green investment standards or sustainable finance. Banks that apply environmental, social, and governance (ESG) principles are now more selective in distributing credit, but

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on the other hand, they also offer lower interest rates for projects that meet sustainability criteria. In other words, renewable energy projects that are able to demonstrate clear social and environmental benefits have the opportunity to gain access to cheaper financing, thereby increasing their financial efficiency. Global climate change is also becoming an increasingly relevant risk factor for the financial efficiency of renewable energy projects. Ironically, although these projects are designed to reduce carbon emissions, they themselves are vulnerable to the impacts of climate change. For example, changing wind patterns can reduce electricity production from wind turbines, while increasing frequency of extreme weather can damage project infrastructure. Therefore, climate risk calculations are now an integral part of assessing the financial viability of projects, with climate insurance and mitigation systems becoming important components of the cost structure.

From the perspective of the global financial market, fluctuations in international interest rates, especially those set by major central banks such as the US Federal Reserve, indirectly affect the cost of capital for renewable energy projects, especially in developing countries that rely on foreign funding. Rising global interest rates will increase the discount rate in calculating the net present value (NPV) of a project, which can make previously financially viable projects less attractive. Therefore, global economic conditions must always be taken into consideration in long-term project planning. Finally, business model innovation is a new driver in improving the financial efficiency of renewable energy projects. Models such as community ownership, energy-as-a-service, and peer-to-peer energy trading allow for diversification of revenue sources and reduced dependence on traditional electricity sales schemes. By leveraging blockchain technology or digital platforms, projects can increase transaction transparency and financial management efficiency, which in turn improves financial performance indicators such as internal rate of return (IRR) and payback period.

Barriers Faced in Implementing VBM in Renewable Energy Projects

One of the main obstacles to implementing VBM in the renewable energy sector is the high level of market and policy uncertainty. Renewable energy, especially in developing countries, is still highly dependent on government incentives, subsidies, and dynamic regulations (A Value-Based Modeling Framework for Solar Energy Utilization and Monitoring - ProQuest, n.d.). Uncertainty about the direction of energy policies, such as changes in feed-in tariffs, green energy quotas, or carbon taxes, can significantly affect the long-term value projections of a project. When policies change suddenly, VBM-based project value estimates become inaccurate, reducing the effectiveness of this method as a basis for decision-making. This situation is exacerbated by the existence of regulatory disparities between regions that make it difficult to apply the VBM approach consistently across multinational project portfolios. In addition, the complexity of assessing economic value and socio-environmental impacts is a challenge in applying VBM principles to renewable energy projects. Value in the context of VBM is generally defined financially, but renewable energy projects bring additional dimensions in the form of environmental benefits, carbon emission reductions, increased energy access, and local community

development. Integrating these non-financial values into the VBM framework requires a more complex and multidimensional evaluation model. Unfortunately, many companies do not yet have measurement tools or reporting systems that are able to quantitatively reflect these values. As a result, the decision-making process tends to return to conventional financial parameters that may not reflect the full contribution of the project to long-term value creation (Rahmadina, 2024).

The next obstacle is related to limited human resources and organizational culture. The implementation of VBM requires a change in the perspective of management and employees towards the decision-making process. They need to understand that value creation does not only include short-term profitability, but also sustainable growth and strategic risk management. However, in practice, many organizations are still oriented towards operational targets and short-term returns. This change requires comprehensive training and strong leadership so that all internal stakeholders can adopt VBM principles (Gawusu et al., 2024). Unfortunately, in the energy sector, especially in developing regions, there is a shortage of professionals who understand the value-based management methodology and are able to integrate it into the project life cycle.

Technology and data availability are also crucial barriers to effective VBM implementation. To accurately calculate the value of a project, companies need reliable and up-to-date data on costs, revenue projections, environmental risks, and market responses to a particular technology. On the renewable energy side, especially for small and medium-scale projects, such data is often incompletely available or not standardized. For example, in solar energy projects in remote areas, information on solar radiation levels, community consumption patterns, and logistics costs can be very limited. This lack of data reduces management's ability to make truly value-oriented decisions. In addition, VBM models often rely on sophisticated analytical technologies and management information systems that are not necessarily available to all organizations, especially renewable energy startups or community project developers (Exploring Learning Obstacles of Pre-Service Chemistry Students Towards Education for Sustainability on the Topic of Biodiesel: A Preliminary Study for Developing Didactic Design | Jurnal Penelitian Pendidikan IPA, n.d.). Another challenge arises from the complexity of stakeholders in renewable energy projects. Unlike conventional projects that tend to have simpler ownership and interest structures, renewable energy projects often involve multiple parties with diverse interests: governments, private investors, international financing institutions, local communities, and environmental organizations. Each party has a different perception of "value" and how to measure it. When there is no consensus on project performance assessment parameters, VBM implementation becomes difficult and prone to conflicts of interest. For example, investors may prioritize quick returns on capital, while local communities place more emphasis on social benefits such as job creation or access to cheap energy. Without a framework that can bridge these interests, VBM principles cannot be implemented optimally (Luthfiani, 2024).

Furthermore, obstacles in financing are also a barrier to VBM implementation. Renewable energy often requires high initial investment with a relatively long payback period. In the VBM framework, this requires a value analysis that relies heavily on long-

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term cash flow projections and stable macroeconomic assumptions (Computational Design of 2D Phosphorus Nanostructures for Renewable Energy Applications: A Review - Er - 2024 - Advanced Electronic Materials - Wiley Online Library, n.d.). However, in reality, access to appropriate financing is often limited, especially for projects in developing countries.

Conservative financing institutions may not have financing instruments that support the characteristics of renewable energy projects. When funding is inflexible or based on value evaluations that do not reflect the renewable energy context, VBM-based strategies are difficult to adopt. Finally, the implementation of VBM is also hampered by the lack of harmonization between the organization's strategic goals and internal incentive structures. In many cases, incentive structures within the organization have not been designed to encourage behavior that creates long-term value. Project managers may only be assessed on short-term achievements such as timely project completion or budget efficiency, without considering how the project contributes to the overall value of the company. Without alignment between individual performance indicators and VBM principles, it will be difficult to foster commitment to value-based strategies throughout the organization (Setyowati, 2021). Considering all the above obstacles, it becomes clear that implementing VBM in renewable energy projects requires systemic efforts involving policy reform, strengthening organizational capacity, developing technology and data, and harmonizing stakeholder interests. Although the challenges are great, successful implementation of VBM will be able to direct the renewable energy sector towards economic efficiency, environmental sustainability, and broader social impact. This transformation will be key in addressing future energy challenges that demand not only efficiency and profit, but also justice and sustainability.

CONCLUSION

The conclusion of the analysis of the financial efficiency of renewable energy projects using the Value-Based Management (VBM) approach shows that this approach is able to provide a more comprehensive picture of long-term value creation. VBM not only assesses project success based on conventional financial indicators such as ROI or payback period, but also considers how strategic and operational decisions impact the overall value of the company. This is especially relevant for renewable energy projects that require large initial investments and face high risks and uncertainties.

The application of VBM allows companies to be more selective in choosing projects with the highest value creation potential. By focusing on parameters such as economic value added (EVA), companies can identify whether a project truly contributes to increasing shareholder value or simply meets short-term financial targets. In the context of renewable energy, VBM also helps integrate sustainability factors and environmental risks into the assessment of project financial performance.

In addition, VBM encourages alignment between managerial objectives and shareholder expectations, which ultimately increases accountability and transparency in investment decision making. Renewable energy projects managed based on VBM principles tend to show higher efficiency in capital use, and are able to create more consistent added

value as global energy technologies and policies develop. Overall, the VBM approach has proven to be an effective strategic tool in improving the financial efficiency of renewable energy projects. By considering the value aspect holistically, VBM not only improves the quality of investment analysis, but also strengthens the competitiveness of companies in the increasingly competitive and dynamic energy sector. This approach is worthy of being the main reference in planning and evaluating sustainable energy projects in the future.

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