
IMPROVING CONTRACT STRATEGY TO ENHANCE THE VIABILITY OF THE OIL TRANSPORTATION PIPELINE BUSINESS



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Abstract

The oil pipeline transportation business faces increasing structural pressure due to declining upstream production, rising operation and maintenance costs from aging assets, and oil price volatility affecting revenue stability. This study aims to formulate adaptive and sustainable contract strategies for the TS Segment as the Oil Transportation Agreement approaches its expiration in 2026. A qualitative case study approach was employed, supported by quantitative analysis. Data were collected through semi-structured interviews, company records, and relevant literature. The analysis included thematic analysis, strategic frameworks (VRIO, PESTLE, stakeholder mapping), and financial evaluation using Discounted Cash Flow simulations, followed by Multi-Criteria Decision Analysis with the Kepner–Tregoe method. The results indicate that the existing commercial model is misaligned with the fixed-cost nature of pipeline operations, leading to revenue volatility and cash flow uncertainty due to oil price-linked tariffs and the absence of long-term capacity commitments. Financial simulations show that a fixed-per-volume tariff provides the most stable performance, generating consistent positive returns above the cost of capital. Strengthening contract structures through long-term capacity commitments and improved minimum payment mechanisms further enhances revenue certainty. These findings highlight the importance of aligning tariff design and contract structure with cost characteristics to ensure business sustainability.

Keywords: Commercial Strategy, Tariff Design, Capacity Commitment, Financial Sustainability, Volume Risk, Infrastructure Business Model

INTRODUCTION

Indonesia's oil and gas industry is currently at a critical juncture as natural decline from aging fields increasingly constrains production capacity and pressures the utilization of midstream infrastructure. According to the SKK Migas Annual Report 2024, national oil lifting reached only 579.7 thousand barrels of oil per day (BOPD), equivalent to 91.3% of the state budget target, while gas delivery achieved 94.4% of its target. This persistent underperformance reflects structural challenges, as more than 70% of producing fields are already in late-life stages, requiring intensive operational interventions merely to maintain production levels (SKK Migas, 2025). Although development drilling activities increased in 2024, this effort has only slowed, rather than reversed, the natural decline trend.

The implications of declining upstream production extend directly to midstream oil transportation systems, particularly pipeline networks that depend on stable throughput to sustain economic viability. Reduced lifting volumes lead to underutilization of pipeline capacity, which in turn compresses revenue and weakens economies of scale. At the same time, aging pipeline infrastructure requires increasing operation and maintenance (O&M) expenditures to ensure safety and reliability. This creates a structural imbalance between rising costs and declining or uncertain revenue streams. Despite these challenges, pipeline transportation remains widely recognized as the most efficient, safe, and cost-effective mode for oil transport, with lower per-unit costs and environmental impact compared to alternatives such as trucking or marine transport.

Within this context, PT Daya Salur Energi (PT DASEGI) plays a strategic role as a midstream operator responsible for transporting oil from upstream production sites to downstream facilities. One of its key assets is the Talora–Sentara (TS) Segment, a 280 km oil pipeline that has been in operation since 2013 and serves as a critical link in the regional oil supply chain. However, the business sustainability of this segment is increasingly challenged by three major factors: rising O&M costs due to asset aging, declining throughput driven by upstream production decline, and commercial pressure related to the expiration of the Oil Transportation Agreement (OTA) in 2026. Under the current contract structure, tariffs are linked to the Indonesia Crude Price (ICP), there is no long-term volume commitment, and reserved capacity is determined annually. These characteristics expose the operator to significant revenue volatility and limit long-term financial planning.

Existing studies in midstream energy infrastructure emphasize the importance of aligning tariff structures and contract mechanisms with the underlying cost characteristics of pipeline systems, which are typically dominated by fixed costs and require high capacity utilization to remain economically viable (Joskow, 2019; Makhholm, 2012). However, there remains limited research addressing how such alignment can be achieved in emerging market contexts like Indonesia, where regulatory frameworks, cost recovery mechanisms, and bargaining dynamics between operators and shippers create additional complexity. In particular, the interaction between declining production, contract design, and financial sustainability in oil pipeline transportation remains underexplored.

Therefore, this study aims to formulate adaptive and sustainable contract strategies for the TS Segment by integrating qualitative insights and quantitative financial analysis. Specifically, it evaluates alternative tariff structures and capacity commitment mechanisms to enhance revenue stability and mitigate volume risk. The findings of this study highlight that fixed-per-volume tariff schemes combined with strengthened long-term capacity

commitments provide a more stable and resilient commercial model. This research contributes to the development of context-sensitive strategies for maintaining the long-term viability of pipeline transportation infrastructure under conditions of structural decline and market uncertainty.

RESEARCH METHOD

Research Design

This study adopts a qualitative case study design focusing on a single case, the TS Segment operated by PT DASEGI, to explore post-2026 contract strategies in oil pipeline transportation. A case study approach is appropriate for examining complex, real-world phenomena where the boundaries between context and subject are not clearly defined (Yin, 2018; Woodside & Wilson, 2003). The research applies an embedded design, integrating quantitative analysis within a qualitative framework to provide a comprehensive understanding of both strategic and financial aspects (Creswell & Plano Clark, 2011; Baxter & Jack, 2008).

The unit of analysis is the TS Segment, with clearly defined boundaries covering commercial, operational, and contractual aspects related to oil transportation. Data triangulation is employed by combining multiple data sources to enhance validity and reliability.

Data Collection

Data were collected from both primary and secondary sources to ensure a comprehensive and triangulated dataset (Eisenhardt, 1989).

Primary data were obtained through semi-structured interviews with key internal and external stakeholders. Internal respondents included senior management such as the Board of Directors, commercial, operations, strategic planning, and risk management managers. External respondents consisted of shippers as users of the pipeline service. Respondents were selected using purposive sampling based on their expertise and involvement in the TS Segment. Interviews were conducted either in person or online, recorded with consent, and transcribed for analysis.

Secondary data included internal company records (historical throughput, tariffs, revenue, O&M costs, etc.), contractual documents (e.g., Oil Transportation Agreement clauses), and relevant literature and industry reports. Additional supporting data included projections of oil prices, production decline rates, and cost assumptions. To ensure confidentiality, the names of business entities and pipeline segments were not explicitly provided or have been disguised. Besides, sensitive financial data were anonymized and presented in aggregated or indexed form.

Data Analysis

Qualitative Analysis

Qualitative data from interviews were analyzed using thematic analysis. The process involved familiarization with the data, open coding to identify key concepts, and axial coding to group related codes into broader themes. This iterative process enabled the identification of key patterns and insights relevant to contract strategy and business challenges.

Strategic Analysis

Strategic analysis was conducted through a combination of internal, external, and stakeholder assessments.:

1. Internal analysis utilized the VRIO framework to evaluate firm resources and capabilities in terms of value, rarity, imitability, and organizational support (Barney, 1991; Knott, 2015).
2. External environment analysis applied the PESTLE framework to identify macro-environmental factors influencing business performance.
3. Stakeholder analysis used the power-interest grid (Mendelow Matrix) to map stakeholder influence and engagement strategies.
4. These analyses were based on interview data, supported by document review and industry context, ensuring alignment with real business conditions.

Financial Analysis

Financial evaluation was conducted using historical analysis and scenario-based simulations. Historical data on volume, revenue, and O&M costs were analyzed to identify trends and baseline performance.

Future scenarios were developed, including (1) ICP-linked tariff, (2) fixed- per-volume tariff, and (3) hybrid tariff models. For each scenario, cash flow projections were simulated and evaluated using Discounted Cash Flow (DCF) analysis to estimate Net Present Value (NPV) and Internal Rate of Return (IRR) (CFI, n.d.). Sensitivity analysis was performed on key variables such as volume decline to assess the robustness of each scenario.

Contract Evaluation and Strategy Selection

Existing contract structures were evaluated qualitatively, focusing on key clauses such as tariff mechanisms, reserved capacity, and ship-or-pay provisions. Strengths and weaknesses of the current contract were identified to assess their impact on revenue stability.

To determine the optimal strategy, a Multi-Criteria Decision Analysis (MCDA) approach using the Kepner–Tregoe method was applied. Strategic alternatives were evaluated based on predefined criteria, including mandatory (“must”) and weighted (“want”) criteria. Each alternative was scored and ranked, enabling a systematic and transparent selection of the most suitable contract strategy.

RESULTS AND DISCUSSION

Business Condition and Strategic Response of the TS Segment

This section presents a comprehensive analysis of the TS Segment’s business condition, combining both qualitative and quantitative approaches to identify key issues and develop appropriate strategic responses. The analysis is structured to provide a holistic understanding of the current performance, underlying challenges, and potential improvement areas within the existing commercial framework.

Current Business Condition

The analysis begins with an assessment of the current business condition, incorporating qualitative findings from stakeholder interviews and strategic analysis using frameworks such as VRIO, PESTLE, and stakeholder mapping. This stage aims to identify the root causes of performance limitations and understand the broader internal and external factors influencing the TS Segment.

Historical Performance Analysis

A historical performance analysis is conducted to evaluate operational trends, revenue behavior, cost structure, and overall financial performance. This analysis establishes

a baseline for understanding the sustainability of the current business model and highlights key structural risks inherent in the pipeline operations.

Financial Analysis and Scenario Simulation

Building on these findings, a financial analysis and scenario simulation is performed using a DCF-based approach to assess the impact of alternative tariff structures on financial performance. This stage allows for a forward-looking evaluation of revenue stability, cost recovery, and investment viability under different commercial scenarios.

Contract Model Evaluation

The analysis is then complemented by a contract model evaluation to assess the effectiveness of the existing contractual framework in managing risks and supporting long-term sustainability. Based on the identified gaps, alternative strategies are developed with a focus on improving tariff design and contract structure.

Multi-Criteria Decision Analysis (MCDA)

Finally, the alternative strategies are evaluated using a Multi-Criteria Decision Analysis (MCDA) approach with the Kepner-Tregoe Decision Analysis method, enabling a structured comparison based on both mandatory and preference criteria. This evaluation supports the selection of the most suitable strategy to ensure the long-term economic viability of the TS Segment.

Qualitative Findings (Interview Results) (Interview Results)

The analysis begins with an assessment of the current business condition derived from qualitative findings from stakeholder interviews.

The results of the interviews conducted with internal and external respondents indicate that the main challenges faced by the TS Segment do not only stem from operational factors but also from the mismatch between the existing commercial model and the dynamics of consumers' needs.

Table 1.
Interview Results with Thematic Coding

Theme	Key Issues (Codes)	Respondents' Insights (Synthesized)	Implication
Revenue Uncertainty	ICP volatility, volume-driven revenue	Revenue is highly dependent on ICP and actual volume, so there is no revenue certainty.	Need for revenue stabilization to mitigate vulnerable business model.
Volume Risk	Natural decline, production dependency	Declining upstream production poses a major risk to the sustainability of pipeline volume.	Need for volume mitigation strategy to mitigate long-term structural risk.
Contract Limitation	No secured volume, weak commitment,	The lack of volume guarantees causes utilization uncertainty.	Need commitment-based contracts (ship-or-pay / reserved capacity).
Tariff Model	ICP-linked tariff, tariff redesign, regulated tariff	The existing tariff model does not provide certainty for the operators, while	Need to redesign the tariff that balances risk.

Theme	Key Issues (Codes)	Respondents' Insights (Synthesized)	Implication
		shippers desire more stable rates.	
Shipper Preference and Behavior	Price sensitivity, safety priority	Shippers choose modes of transportation based on price and safety.	The pipeline must remain competitive in terms of cost, integrity, and reliability.
Flexibility vs Certainty Trade-off	Flexibility, contract duration, tariff expectation	Shippers need flexibility, while operators need certainty of volume and revenue.	There is a need for a contract design that balances flexibility and certainty.
Integrity and Reliability Requirement	Pipeline integrity, reliability, HSSE	The reliability of the pipeline becomes critical to maintaining supply and customer trust.	Integrity and reliability require high cost but non-negotiable, so it needs to be maintained.
Cost Pressure (O&M)	Maintenance cost, aging infrastructure	O&M costs are increasing due to aging infrastructure.	Need for risk-based cost optimization to maintain the balance between cost efficiency and operational reliability.
Utilization Opportunity	Underutilized capacity, additional volume	There are still opportunities to increase pipeline utilization.	Need proactive commercial strategies to capture volume.
Customer Orientation	Satisfaction, trust, flexibility	Need to maintain shipper satisfaction and trust through service and flexibility.	Relationship management becomes a key factor.

Key Challenges

In general, the findings point to three main issues:

1. Revenue uncertainty
2. Volume risk due to natural decline
3. Limitations of contract and tariff schemes

Additionally, operational factors such as pipeline integrity and reliability remain fundamental aspects that cannot be compromised, despite causing cost pressures.

Internal Perspectives

From an internal perspective, respondents emphasized that the revenue of the TS Segment is heavily influenced by two main factors: the volatility of ICP and the actual volume transported through the pipeline. This dependence leads to revenue uncertainty, especially in upstream production conditions experiencing natural decline. This is reinforced by the absence of a contract mechanism that guarantees volume in the long term.

External Perspectives (Shippers)

External respondents (shippers) provide a complementary perspective. Shippers emphasize that the decision to choose oil transportation mode is heavily influenced by price and safety aspects. Moreover, shippers also show a preference for more stable tariffs (fixed tariff per barrel) as well as flexibility in contracts, such as ship-or-pay schemes or volume/reserved capacity adjustments. These expectations indicate a need for a contract structure that is more adaptive to their business conditions.

Trade-off Between Flexibility and Certainty

One of the root problems identified in the current commercial relationship is the trade-off between flexibility and certainty. From the company's operator's perspective, certainty in volume and revenue is needed to maintain business viability and cover relatively high operational costs, especially related to maintenance and pipeline integrity. However, from the shipper's perspective, flexibility becomes an important factor in dealing with production and oil price uncertainties.

Integrity and Pipeline Reliability

Furthermore, pipeline integrity and reliability were consistently highlighted as essential themes across all respondents. Despite the commercial pressures, maintaining high operational standards to ensure supply security and customer trust is seen as critical, albeit increasing operational and maintenance costs, especially in the context of aging infrastructure.

Opportunities for Improvement

Amidst these challenges, there are opportunities for improvement, particularly through optimizing infrastructure utilization and increasing volume by collaborating with upstream parties or acquiring new shippers.

Strategic Analysis

VRIO Analysis

The VRIO analysis evaluates whether the resources and capabilities possessed by PT DASEGI in running the TS Segment can create a sustainable competitive advantage. Pipeline infrastructure is a key asset that meets almost all VRIO criteria, and its value lies in its efficiency and reliability. However, the analysis shows that the advantage has not been fully translated into optimal business performance. The future strategy should be more focused on the tariff and contract design optimization, to be able to convert the potential advantages into a sustainable business performance.

Table 2.
VRIO Analysis Result

Resource/ Capability	V (Valuable)	R (Rare)	I (Imitation Costly)	O (Organized to Capture Value)	VRIO Assessment	Strategic Implication
Pipeline Infrastructure	✓	✓	✓	Partial	Pipeline infrastructure is highly valuable, rare, and difficult to replicate, yet it has not been optimally utilized due to low utilization and an unsupported commercial structure.	Strong potential competitive advantage but not yet realized (underexploited advantage)

Resource/ Capability	V (Valuable)	R (Rare)	I (Imitation Costly)	O (Organized to Capture Value)	VRIO Assessment	Strategic Implication
Strategic Network Position	✓	✓	✓	Partial	Strategic positions in the distribution network provide high value and are difficult to replicate but have not yet been fully monetized due to shipper flexibility and weak contracts.	Potential advantages that depend on strengthening the commercial model
Operational Capability	✓	×	×	✓	Operational capabilities support system reliability, but they are not unique and can be replicated by other operators.	Competitive parity (basic operational excellence)
Legal & Institutional Legitimacy	✓	✓	✓	✓	Ownership of permits and operational mandates provides a strong and hard-to-replicate position in the short term.	Sustainable competitive advantage as a barrier to entry
Shipper Relationship	✓	×	×	Partial	The relationship with the shipper is valuable but not exclusive, with high bargaining power on the customer's side.	Competitive parity with the risk of losing volume
Current Commercial Model	×	×	×	Partial	Current tariff and contract models are unable to protect revenue and increase risk exposure.	Weakening the ability to capture value

PESTLE Analysis

PESTLE analysis identifies external factors affecting the TS Segment's business. The political, economic, social, technological, legal, and ecological factors all contribute to the level of risk and opportunities the company faces. The analysis indicates that the TS Segment operates in an environment with a high level of uncertainty, particularly due to oil price volatility and changes in shipper behavior insufficient contract structures. This raises the importance of the need for a more stable business model with less external exposure.

Table 3.
PESTLE Analysis Result

Aspect	Key Issues	Level of Impact	Relevance to TS Segment	Strategic Implication
Political	Direction of national energy policy and infrastructure development	Moderate	Influences energy distribution priorities and potential support for pipeline infrastructure	Requires alignment with government policies and maintaining strategic flexibility

Aspect	Key Issues	Level of Impact	Relevance to TS Segment	Strategic Implication
Economic	Volatility of ICP and oil demand conditions	High	Directly affects tariff levels and revenue stability	Requires a more stable tariff structure that reduces dependency on ICP
Social	The demand for flexibility from service users	Moderate	Shippers require greater flexibility in volume commitments and contract terms	Requires a more adaptive and responsive contract model
Technological	Improvement of operational efficiency and limitations of alternative transportation modes	Low-Moderate	Pipeline remains the primary transportation mode, with technology playing a greater role in efficiency than substitution	Focus on enhancing operational efficiency, particularly in monitoring and maintenance
Legal	Tariff and contract structures that do not yet provide sufficient certainty	High	Affects revenue certainty and contractual relationships with shippers	Requires strengthening contract terms and redesigning the tariff structure
Ecological	Environmental regulations and increasing sustainability pressures	Moderate	Pipeline transportation is relatively more efficient but still requires environmental compliance	Can become a source of competitive advantage if managed effectively

Stakeholder analysis identifies key parties involved in the TS Segment business and evaluates their interests and power. Shippers, PT DASEGI's internal management, regulators, and shareholders all play significant roles in shaping the commercial strategy. The analysis emphasizes the need to balance the interests and power of these stakeholders to ensure successful contract negotiations and sustainable business outcomes.

Meanwhile, the shareholders or holding have an interest in financial performance and asset sustainability, but their involvement tends to be at a strategic level. Their role is important in providing policy direction and support for investment decisions or changes in business models. Therefore, the appropriate engagement strategy is to maintain regular reporting and strategic communication to ensure alignment with their expectations and long-term objectives.

Figure 1.
Stakeholder Mapping (Power–Interest Grid)

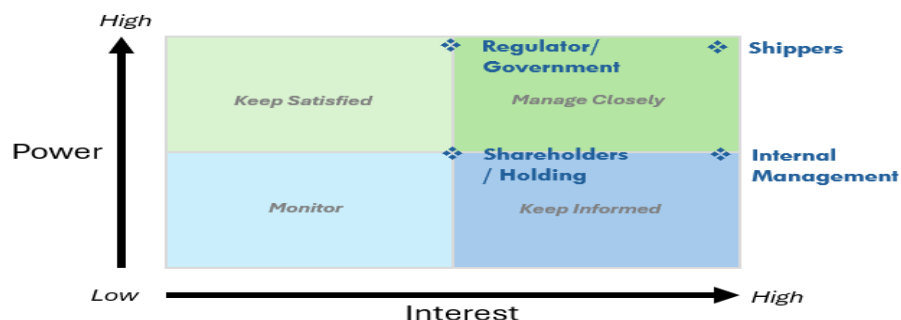


Table 4.
Stakeholder Analysis Result

Stakeholder	Role	Level of Power	Level of Interest	Concern	Engagement Strategy
Shippers	Oil transportation service user	High	High	Tariff, flexibility, and reliability	Collaborative, win-win based negotiation to balance flexibility and certainty
Internal Management	Operational and commercial management	Medium	High	Business sustainability, revenue stability, and asset utilization and optimization	Strong internal alignment and consistency in strategic direction
Regulator / Government	Policy and licensing regulators	High	Medium	Regulatory compliance and energy sector stability	Consultative approach and policy alignment
Shareholders / Holding	Owner and strategic decision-maker	Medium	Medium	Financial performance and business sustainability	Regular reporting and strategic communication

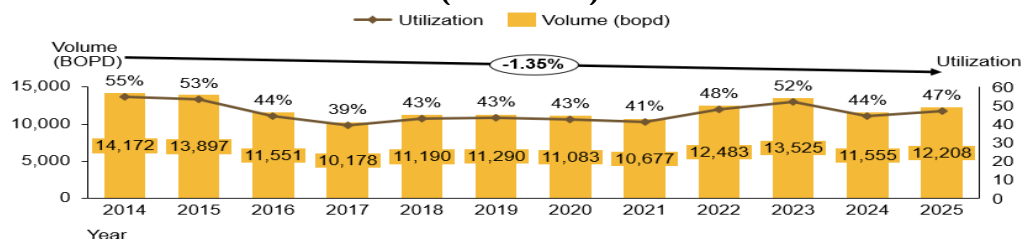
Historical Performance Analysis

This section aims to evaluate the historical performance of the TS Segment during the 2014–2025 period, both from operational and financial perspectives. This analysis is conducted to establish a strong baseline in the preparation of future financial models and to assess the sustainability level of the current business model and commercial schemes. The evaluation is conducted through three four main dimensions: operational performance, revenue performance, and cost structure, and profitability. These three four dimensions are then synthesized to identify the structural risks inherent in the TS Segment and serve as the basis for valuation analysis using NPV and IRR.

Operational Performance Analysis

The operational performance of the TS Segment is measured through the volume of oil transportation (throughput) and the utilization rate of pipeline capacity. During the analysis period, the transportation volume showed a declining trend compared to the early years of operation. The annual volume recorded a decrease from around 5.2 million barrels in 2014 to a range of 3.7 – 5.1 million barrels in the subsequent period. On a daily basis, throughput ranges from 10,000 to 14,000 BOPD, which is still far below the pipeline’s design capacity of 26,000 BOPD.

Figure 2.
TS Segment Performance: Volume Throughput and Utilization (2014-2025)



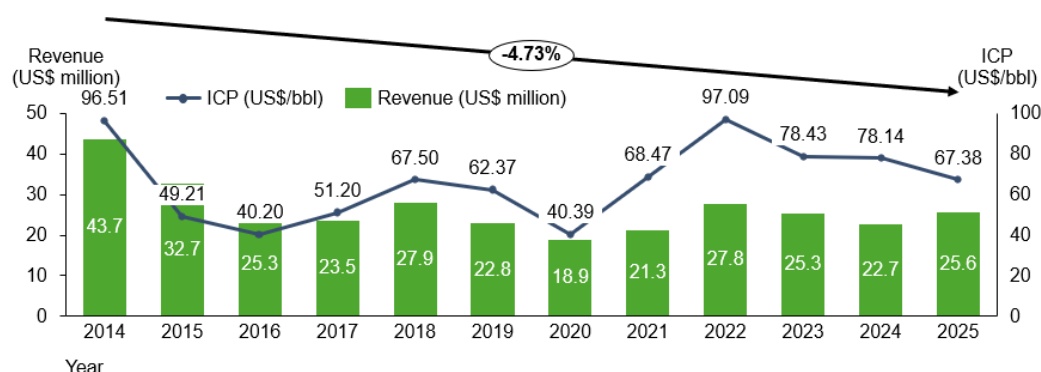
Although there is a slight recovery in volume during the 2022–2025 period, the capacity utilization rate remains in the range of 44–52%. This indicates a condition of structural underutilization, not just a short-term fluctuation.

These findings demonstrates that the main risk on the operational side stem from the demand influenced by the natural decline trend in upstream production. Thus, the TS Segment faces the risk of excess capacity that could potentially pressure long-term economic efficiency.

Revenue Analysis

The revenue performance of the TS Segment showed significant fluctuations during the analysis period. Revenue experienced a sharp decline from around US\$ 43.7 million in 2014 to US\$ 18.9 million in 2020, before rising again to the range of US\$ 25–28 million in 2022–2025. This pattern shows that TS Segment's revenue is not only influenced by the volume of transportation but also significantly affected by the movement of ICP. This is due to the tariff mechanism that is currently still linked to ICP.

Figure 3.
TS Segment Performance: Revenue and ICP Movement
(2014–2025)



The strong correlation between revenue and ICP indicates that the financial performance of the TS Segment is more price-driven than volume-driven. In other words, even if the volume remains relatively stable or even decreases, an increase in oil prices can significantly boost revenue, and vice versa. This condition creates double exposure risk: volume risk due to upstream production decline and price risk due to global oil market volatility.

Cost Structure Analysis

The O&M costs of the TS Segment show relatively stable over the analysis period, ranging between US\$ 7–10 million per year after 2014. In contrast to revenue, costs did not experience a significant decrease despite the decline in distribution volume. This indicates that the cost structure of the TS Segment is predominantly fixed and relatively inelastic to changes in volume. As a result, a substantial portion of the costs must be incurred regardless of the level of pipeline utilization.

Figure 4.
TS Segment Performance: O&M Cost per Barrel and Transportation Volume
(2014–2025)

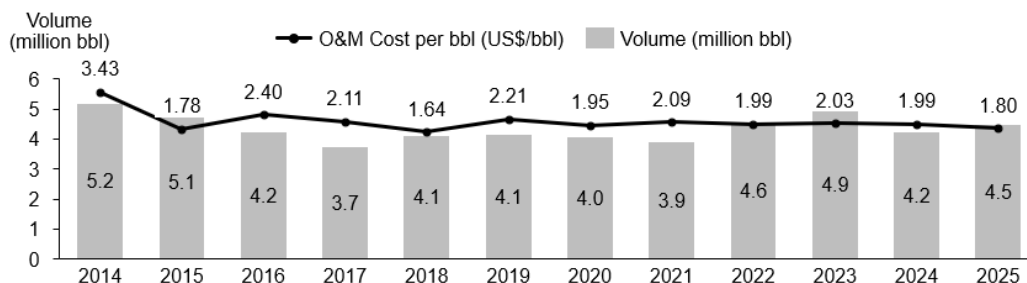


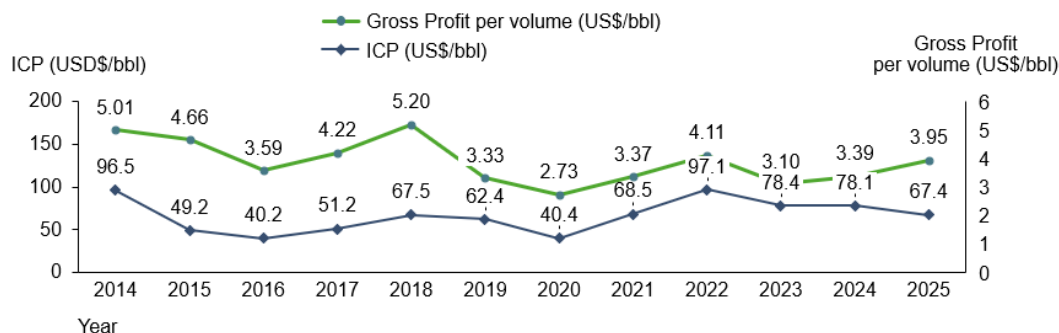
Figure 4 The implication is that when the volume decreases, the cost per barrel increases, which in turns exerts pressure on profit margins. Furthermore, aging infrastructure may lead to higher maintenance costs in the long term, thereby adding additional pressure on profitability.

Profitability Analysis

From the combination of revenue and cost trends, it can be concluded that the TS Segment is experiencing margin compression. Although costs are relatively stable, the decrease in volume and volatility in revenue have led to a decline in economic efficiency per unit. Implicitly, this condition is reflected in the rising cost per barrel and the fluctuations in margin per barrel. This indicates that the operational leverage of the pipeline business cannot be maximized due to low utilization.

Figure 5.

TS Segment Performance: Gross Profit per Barrel and ICP Movement (2014–2025)



Thus, the profitability of the TS Segment becomes increasingly sensitive to external changes, especially oil prices, and is not supported by a robust business structure.

From the historical data, the DCF-based financial feasibility analysis yields a positive NPV of US\$15 million and an IRR of approximately 12%, these results should be interpreted with caution, as the apparent feasibility is largely driven by favorable external conditions—particularly oil prices—rather than reflecting the intrinsic strength of the underlying business model.

Financial Analysis and Scenario Simulation

Key Assumptions

The financial model is based on a variety of assumptions, including volume projections, tariff structures, operational costs, and investment requirements. Three tariff models—ICP-linked, fixed-per-barrel, and hybrid tariffs—are tested to assess their impact on revenue stability and financial feasibility.

Table 5.
Key Assumptions for Financial Model

Category	Parameter	Assumption	Source/Basis
Contract	Period	8 years (2026–2033)	Expected remaining economic useful life
	Ship-or-pay	80%	Scenario design
Revenue	Volume	12,228–16,386 BOPD	Historical data, information obtained from the shipper, and the company's internal forecast
	Tariff	Three Scenarios: ● ICP-Linked Tariff ● Fixed-per-Barrel Tariff ● Hybrid Tariff	● Current OTA ● Scenario design ● Scenario design
Cost	O&M Cost	US\$ 9.12–12.16 million per year	Historical data
	Loss Prevention Expense	Volume × (1%–0.5% × Tariff)	Scenario design
	CAPEX	US\$ 1.80–4.37 million per year	Internal forecast
Asset Book Value	Asset Book Value	US\$ 33 million (as of December 31, 2025)	Company's internal data
Financial	Discount rate	8.30%	WACC
	Escalation	4.20%	Average US\$ inflation rate over the past five years
	Corporate Income Tax	22%	Indonesian regulation

Scenario Design and Simulation Framework

Scenario 1: ICP-Linked Tariff

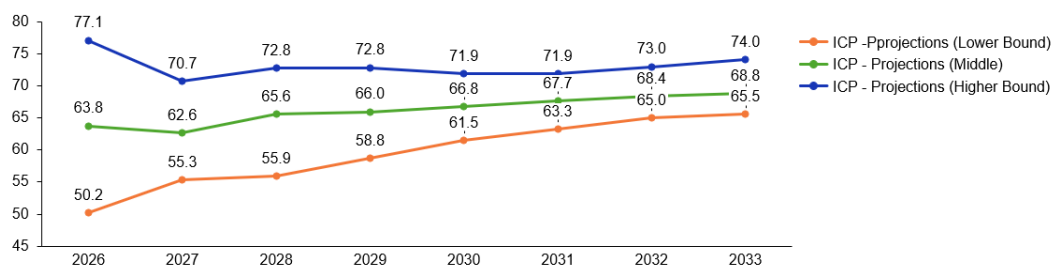
The ICP-linked tariff is a mechanism currently used in existing contract, where the tariff amount is determined based on a specific range of ICP prices. In this mechanism, an increase in ICP will be followed by an increase in the tariff, thereby creating a direct relationship between oil prices and the operator's revenue. The main characteristics of this scenario are:

1. The tariff is determined based on a specific ICP range.
2. There is no fixed payment component.
3. The operator's revenue fully depends on actual volume and oil prices.

Based on historical data from the period 2014–2025, the average ICP was recorded at US\$ 66.41 per barrel. Referring to the tariff scheme in existing contract, ICP range resulted in a tariff of US\$ 7.76 per barrel. In the new contract scenario, the same ICP range is assumed

to have a tariff of US\$ 6.70 per barrel, which is used as a baseline for comparison with other scenarios. Subsequently, the tariff for other ICP ranges is calculated with a deviation of US\$ 0.25 per range. To capture the uncertainty of oil prices, three ICP projection scenarios are used: lower bound, middle case, and upper bound, which are formulated based on the company's internal data and analysis.

Figure 6.
ICP Projection



Scenario 2: Fixed-per-Barrel Tariff

In the fixed tariff scenario, the tariff is set at a constant US\$ 6.70 per barrel throughout the contract period. The value of the tariff is set considering the financial simulation approach aimed at maintaining the economic attractiveness of the TS Segment at a level comparable to its historical performance. Based on historical performance analysis, the TS Segment generated an IRR of approximately 12%. The determination of this value is based on the consideration of balancing the competitiveness of the tariff for the shipper and the operator's need to maintain financial sustainability. Thus, several tariff levels were simulated to identify a tariff capable of maintaining a relatively comparable level of return under projected conditions for the 2026-2033 period. The main characteristics of this scenario are:

1. The tariff is stated given in US\$ per volume (barrel) and does not depend on ICP.
2. There are no separate fixed charges components.
3. The revenue of the operator varies with the revenue depends on the actual transportation volume.

Scenario 3: Hybrid Tariff

In this study, the hybrid tariff is formulated as a combination of a fixed component and a variable component that reflects the cost characteristics of a pipeline system dominated by fixed costs. This structure is designed to ensure adequate cost recovery while creating a balance between revenue stability for the operator and flexibility for the shipper.

The tariff formulation refers to the cost-of-service approach, where the tariff is derived from the recovery of total costs and a reasonable return on the asset base. In line with this principle, the cost components are classified based on their behavior toward transportation volume.

The fixed component represents costs that must be incurred regardless of the transportation volume and therefore recovered through a capacity-based charge. This component consists of Fixed O&M Cost (assumed to be 91.65% of total O&M), Depreciation, Asset Retirement Obligation (ARO), and Required Return.

For contract implementation, this fixed component is further converted into a fixed monthly charge, which represents the operator's fixed monthly revenue requirement. Based

on the calculations, the fixed monthly charge amounts to approximately US\$ 1.71 million per month during the contract period, which will be charged to each shipper proportionately based on each reserved capacity.

The variable components in this model reflect costs that move in accordance with transportation volume, including Variable O&M Cost, which is assumed to account for 8.35% of the total O&M. This component is allocated based on the actual transport volume (throughput). Based on the calculations, a variable throughput fee of approximately US\$ 0.25 per barrel was obtained, reflecting the operational costs that depend on the utilization rate of the pipeline.

By combining these two components, the hybrid tariff in this model is formulated as:

$$\text{Hybrid Tariff} = \text{Fixed Tariff} + \text{Variable Tariff}$$

However, to enhance the implementability in the contract, this rate is not stated as a single value per barrel, but rather as a two-part structure consisting of a fixed monthly charge, representing the fixed component, and a variable throughput fee, representing the usage-based component. Thus, the proposed tariff structure in this study can be stated as:

US\$ 1.71 million per month + US\$ 0.25 per barrel

Simulation Results and Analysis

Scenario 1: ICP-Linked Tariff

1) Baseline Result

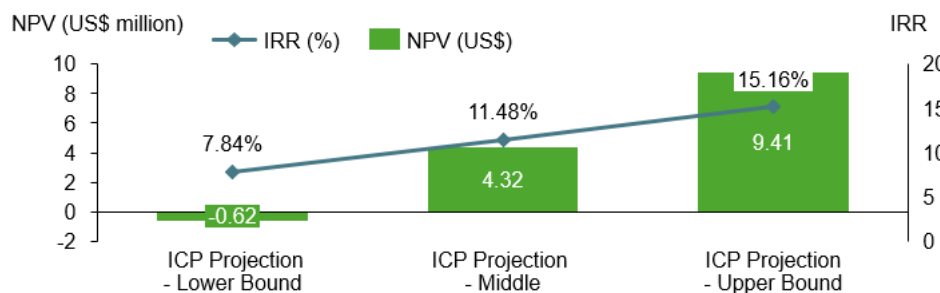
In the middle case condition (ICP projections – middle), it was obtained IRR of 11.48% NPV of US\$ 4.32 million.

2) Sensitivity

The simulation results show significant variation:

- ICP Projection – Lower Bound: NPV negative of –US\$ 0.62 million and IRR of 7.84% (below WACC)
- ICP Projection – Middle: NPV positive of US\$ 4.32 million and IRR of 11.48% (above WACC)
- ICP Projection – Upper Bound: NPV increased to US\$ 9.41 million and IRR of 15.16% (above WACC)

Figure 7.
ICP-Linked Tariff Simulation



These results indicate that ICP-linked tariffs have high upside potential, but also significant downside risk. Dependence on oil prices causes income uncertainty and high-risk exposure for pipeline operators.

From the shipper perspective, the ICP-linked tariff provides a certain degree of commercial flexibility because transportation costs move in line with oil market conditions. This may reduce cost pressure during periods of low oil prices and support the economic viability of upstream operations.

Scenario 2: Fixed-per-Barrel Tariff

Baseline Result

At the base tariff of US\$ 6.7 per barrel, the model generates an IRR of 12.22% and an NPV of US\$ 5.28 million. These results confirm that the fixed-per-barrel tariff is financially viable, as it produces returns well above the WACC of 8.30%.

Sensitivity

A broader sensitivity analysis was conducted by varying the tariff from US\$ 6.3/bbl to US\$ 6.8/bbl to assess the robustness of the financial performance. The results show a clear relationship between tariff level and viability:

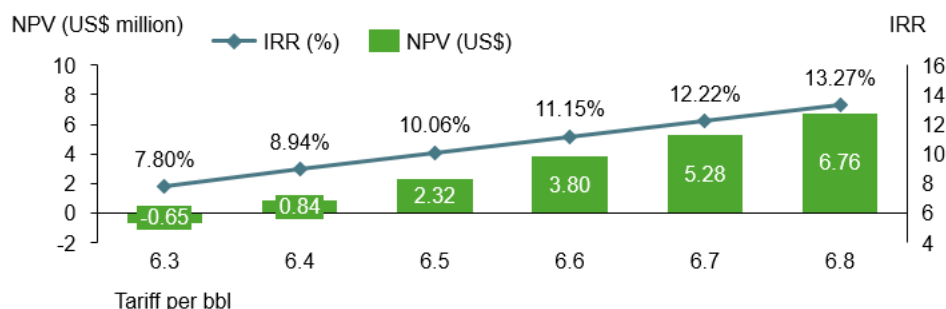
At the lower bound (US\$ 6.3/bbl), the project is financially unviable, with an NPV of –US\$ 0.65 million and an IRR of 7.80%, which is below the WACC.

At US\$ 6.4/bbl, the project begins to approach breakeven, with a marginal NPV of US\$ 0.84 million and an IRR of 8.94%, slightly exceeding the WACC.

From US\$ 6.5/bbl onwards, financial performance improves more significantly, with NPV increasing to US\$ 2.32 million and IRR reaching 10.06%.

At US\$ 6.6–6.8/bbl, the project demonstrates strong financial viability, with NPV ranging from US\$ 3.80 million to US\$ 6.76 million and IRR increasing from 11.15% to 13.27%.

Figure 8.
Fixed-per-Barrel Tariff Simulation



Overall, the fixed-per-barrel tariff scheme demonstrates not only strong financial viability at the base case, but also a clearly identifiable economic threshold and a measurable margin of safety. In addition, this scheme provides revenue stability and reduces exposure to external price volatility, resulting in more consistent financial performance. The fixed-per-barrel tariff is also calibrated to balance revenue predictability for the operator with commercial reasonableness for the shipper, ensuring long-term financial viability without compromising the shipper's operational flexibility and budgeting efficiency.

Scenario 3: Hybrid Tariff

Baseline Result

In the initial formulation (fixed tariff of US\$ 1.71 million per month and variable tariff of US\$ 0.25 per barrel, it was obtained IRR of 3.93% and NPV of –US\$ 5.07 million. This result shows that the hybrid tariff under baseline conditions is not financially viable.

Sensitivity

Adjustments were made to the fixed component to see the potential for performance improvement:

Fixed tariff increased by 5% and variable tariff remains the same: IRR increased to 7.05% and NPV increased to –US\$ 1.49 million.

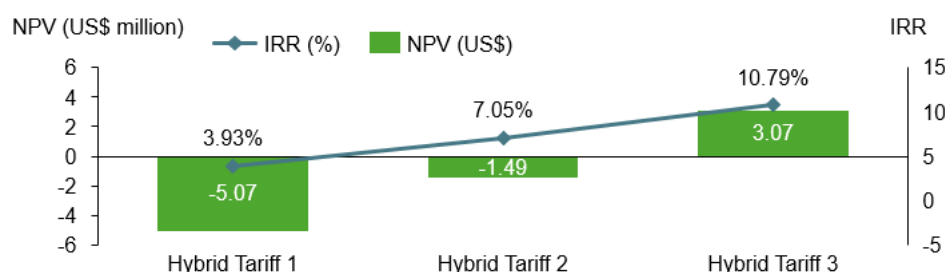
Fixed tariff increased by 10% and variable tariff remains the same: IRR increased to 10.79% and NPV of US\$ 3.07 million.

Table 6.
Hybrid Tariff Scenarios

Hybrid Tariff	Fixed Tariff (US\$ per month)	Variable Tariff (US\$ per bbl)
1	1.71 million	0.25
2	1.80 million	0.25
3	1.89 million	0.25

This result shows that hybrid tariffs are very sensitive to the level of fixed charges and require significant adjustments to achieve financial viability. In addition, increasing the fixed component introduces higher fixed payment commitments for shippers, reducing contractual flexibility and potentially affecting their willingness to commit to long-term agreements.

Figure 9.
Hybrid Tariff Simulation



While the hybrid tariff offers a more balanced risk-sharing mechanism by securing partial fixed cost recovery for the operator, the high fixed component required to achieve financial viability under the current volume profile undermines its practical commercial attractiveness.

Robustness Analysis: Impact of Volume Decline

To complement the sensitivity analysis of tariff, a robustness analysis was conducted by simulating a gradual decline in transportation volume. This analysis is particularly important given the characteristics of the TS Segment business, which heavily relies on upstream supply that naturally decline as oil fields mature.

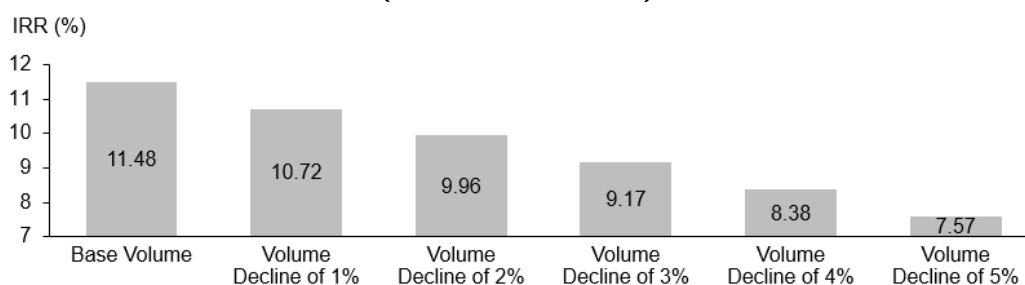
In this analysis, volume reduction is simulated from the baseline condition up to a 5% decrease, with a 1% interval applied to each tariff scenario. The main objective is to evaluate the resilience of each tariff scheme to the risk of throughput decline and to assesst the sensitivity level of IRR to volume changes.

The simulation results indicate that all tariff schemes are negatively affected by volume decline. However, there are significant differences in the level of sensitivity and resilience across the schemes.

ICP-Linked Tariff

Under this scheme, the IRR gradually decreases from 11.48% in the baseline condition to 7.57% under a 5% volume reduction scenario. This indicates that, beside being exposed to oil price volatility, this scheme also has a relatively high sensitivity to volume changes, resulting in a double exposure risk for the operator. Notably, at a 5% decline in volume, the IRR falls significantly below the WACC, indicating that the project becomes financially unattractive under such conditions.

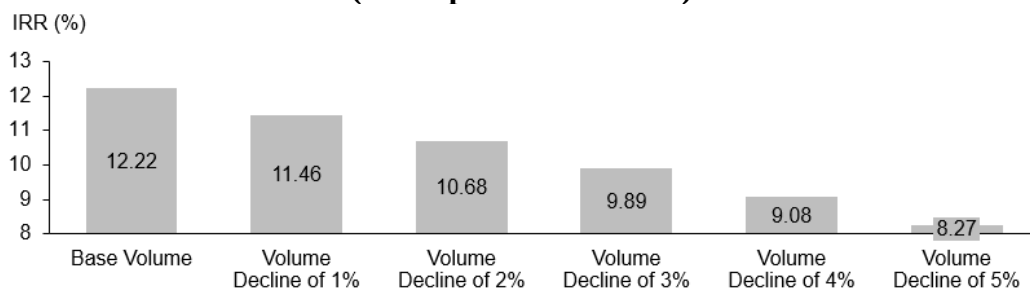
Figure 10.
Robustness Test: IRR Sensitivity to Volume Decline
(ICP-Linked Tariff)



Fixed-per-Barrel Tariff

Under the fixed-per-barrel tariff scheme, the IRR decreases from 12.22% in the baseline condition to 8.27% under a 5% volume reduction scenario. Despite this decline, the IRR remains close to the WACC of 8.30%, indicating that the project is still near the threshold of financial viability even under stressed conditions. This suggests that the fixed-per-barrel tariff demonstrates relatively stronger resilience to volume risk compared to other schemes. The stability of this scheme is driven by its independence from external factors such as oil price fluctuations, meaning that financial performance is primarily influenced by a single variable, which is volume.

Figure 11.
Robustness Test: IRR Sensitivity to Volume Decline
(Fixed-per Barrel Tariff)

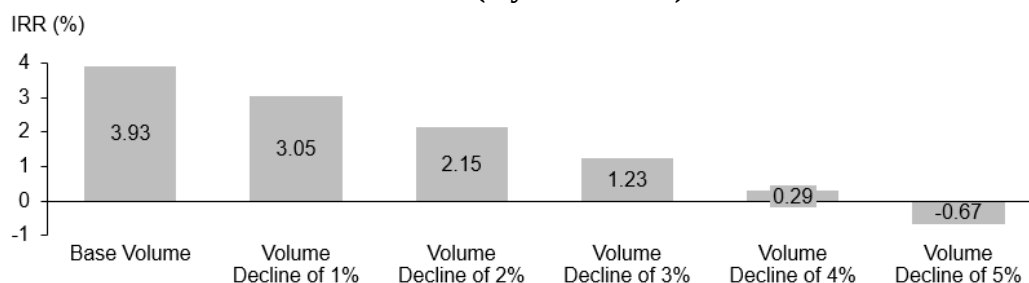


Hybrid Tariff

Under the hybrid tariff scheme, the impact of volume reduction is significantly more pronounced. The IRR declines from an already low level of 3.93% in the baseline condition to -0.67% under a 5% volume reduction scenario. This indicates that the project becomes

financially unviable under relatively moderate volume stress. This result suggests that the hybrid scheme, in its current configuration, is highly vulnerable to throughput decline. Its performance depends on the recovery of fixed cost components, which requires a sufficient level of utilization to reach the economic breakeven point. As volume decreases, the ability to recover these fixed components deteriorates, leading to a rapid decline in financial performance.

Figure 12.
Robustness Test: IRR Sensitivity to Volume Decline
(Hybrid Tariff)



From a comparative perspective, the fixed-per-barrel tariff demonstrates the highest robustness to volume decline, with a relatively controlled decrease in IRR and more sustained financial viability across most scenarios. In contrast, the ICP-linked tariff shows higher sensitivity due to its dual exposure to both volume and oil price fluctuations, increasing overall uncertainty. Meanwhile, the hybrid tariff is the most vulnerable, as its cost recovery heavily depends on sufficient utilization and volume commitment.

These findings reinforce that, in a pipeline business characterized by high fixed costs and declining volume risk, revenue stability and predictability are more critical than pricing flexibility. Therefore, tariff structures that minimize exposure to external variables and ensure stable cash flows are better suited to support the long-term sustainability of the TS Segment.

Contract Model Evaluation

Overall, the existing OTA structure demonstrates a balanced but incomplete contract design. While certain elements such as ship-or-pay and tariff review mechanisms provide partial risk mitigation and flexibility, the absence of long-term commitment and reliance on variable pricing limit its ability to support revenue stability, financial sustainability, and long-term planning. Therefore, enhancements in contract structure and tariff design are necessary.

The existing OTA exhibits four key characteristics: a ship-or-pay mechanism (80% minimum volume commitment) that provides short-term revenue protection but fails to address long-term demand uncertainty; the absence of long-term reserved capacity commitment, which limits the operator's visibility for utilization forecasting and investment planning; a variable tariff linked to ICP that creates revenue volatility inconsistent with the pipeline's fixed-cost structure; and a tariff review clause that, while offering adaptability, introduces negotiation risks without guaranteeing timely or effective adjustments.

Table 7.
Contract Model Evaluation

Aspect	Existing Condition	Implication
Ship-or-Pay Mechanism	Implemented in existing OTA	Providing minimum income protection, but limited without long-term commitment
Long-Term Reserved Capacity Commitment	Not available	Low volume visibility makes long-term planning difficult.
Tariff Scheme	Linked to ICP	Volatile revenue and misaligned with the cost structure
Tariff Review	Allowed to be reviewed periodically	Flexible, but does not provide certainty of results.

Development of Alternative Strategies

Contractual Design as a Mandatory Foundation

The development of alternative strategies is grounded in three mandatory contractual improvements applicable across all proposed schemes:

A refined ship-or-pay mechanism that preserves minimum revenue certainty for the operator while accommodating shipper flexibility under defined conditions such as force majeure and planned maintenance.

A long-term reserved capacity commitment with structured adjustment windows to enhance planning visibility while addressing upstream production uncertainties, force majeure, and regulatory constraints

A more clearly structured tariff review mechanism to ensure transparent and justifiable adjustments in response to evolving business conditions.

These contractual enhancements serve as foundational enablers, with strategic differentiation among alternatives determined solely by the tariff scheme applied.

Alternative Strategy Based on Tariff Schemes

Assuming that the contractual foundation has been strengthened, alternative strategies in this study were developed based on differences in tariff structures.

Table 8.
Alternative Strategy Based on Tariff Schemes

Tarif Scheme	Development Focus	Main Objectives
ICP-Linked Tariff	- Smoothing within the ICP range - Partial indexation (not 100% following ICP)	Reducing volatility without sacrificing flexibility
Fixed-per-Barrel Tariff	- Elimination of dependence on ICP - Establishment of a fixed tariff based on per barrel - Integration of an escalation mechanism (e.g., inflation)	Increasing the stability and predictability of income
Hybrid Tariff	- Separation of tariff components into fixed (capacity charge) and variable (throughput) - Determination of the proportion of fixed vs. variable - Integration of the minimum revenue mechanism	Creating a balance between stability and flexibility

The development direction presented for each alternative does not become the main variable in the evaluation process, but rather a consideration for implementation if that alternative is chosen. Thus, the evaluation in the next section will focus on the fundamental differences between tariff schemes, particularly in terms of revenue stability, flexibility, risk allocation, and implementation feasibility.

Strategy Combination Evaluation Using MCDA

Methodology Approach

To evaluate the alternative strategies that have been developed, this study uses the Multi-Criteria Decision Analysis (MCDA) approach with the Kepner-Tregoe Decision Analysis method. With the separation between must and want criteria, this approach is highly relevant in the context of pipeline commercial strategy, where there is a combination of non-negotiable minimum requirements (such as financial viability and contract implementability), as well as strategic preference factors like revenue stability and flexibility.

Analysis Structure and Criteria

According to the Kepner-Tregoe principles, the evaluation process is conducted in two main stages:

“Must” Criteria (Screening Stage)

The initial stage aims to ensure that each alternative meets the minimum critical requirements. Alternatives that do not meet any of these criteria will be eliminated and not proceed to the next stage. In this study, the mandatory criteria are established as follows:

Table 9.

“Must” Criteria (Screening Stage)

Criteria	Explanation
Financial Viability	Generating a positive NPV and an IRR above the cost of capital
Contract Implementability	Can be applied in negotiations with the shipper and obtain regulatory approval.
Operational Feasibility	Does not require significant changes to the existing infrastructure.

“Want” Criteria (Evaluation Stage)

Alternatives that pass the screening stage are then evaluated using want criteria, which reflect the company’s strategic preferences. In addition, the evaluation criteria are derived from the results of the previous analysis and are aligned with industry best practices in midstream infrastructure. Each criterion is assigned a weight according to its level of importance, and the alternatives are scored using a scoring system to produce a weighted score. In this study, the evaluation criteria and their weights are established as follows:

Table 10.

“Want” Criteria (Evaluation Stage)

Criteria	Explanation	Weight (%)
Financial Attractiveness	The ability to generate optimal NPV and IRR	30
Revenue Stability	Ability to maintain income stability	25
Risk Allocation	Distribution of risk between the operator and the shipper	20
Flexibility	Ability to adapt to market changes	15

Negotiability	The ease of reaching agreement and acceptability to the shipper	10
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This weight reflects the company's strategic priorities, which place financial attractiveness and revenue stability as primary factors, in line with the characteristics of a capital-intensive pipeline business with high fixed costs.

Scoring and Results

Based on the screening stage of the must criteria, all developed tariff strategy alternatives (ICP-linked, fixed-per-barrel, and hybrid) have met these mandatory criteria, allowing them to proceed to the want criteria evaluation stage.

On the evaluation stage, the assessment is conducted using a scale of 1–5, where each score represents the level of performance relative to each want criterion. The scoring scale is defined as follows:

1 (Very Low): The alternative performs significantly below expectations and does not meet the criterion effectively.

2 (Low): The alternative shows limited performance and only partially meets the criterion.

3 (Moderate): The alternative meets the criterion at an acceptable level but with notable limitations.

4 (High): The alternative performs well and meets the criterion with minor limitations.

5 (Very High): The alternative performs excellently and fully meets the criterion with minimal or no limitations.

The calculation is performed by multiplying the score of each criterion by its weight, then summing all the values for each alternative. The evaluation results are as follows:

Table 11.

Kepner-Tregoe Decision Analysis

MUSTS		Alternative-1 ICP-Linked Tariff		Alternative-2 Fixed-per-Barrel Tariff		Alternative-3 Hybrid Tariff	
Financial Viability		Go		Go		Go	
Operational Feasibility		Go		Go		Go	
Contract Implementability		Go		Go		Go	
WANTS	Weight	Alternative-1 ICP-Linked Tariff		Alternative-2 Fixed-per-Barrel Tariff		Alternative-3 Hybrid Tariff	
		Rating	Score	Rating	Score	Rating	Score
Financial Attractiveness	30%	3	0.9	5	1.5	3	0.9
Revenue Stability	25%	2	0.5	5	1.25	4	1
Risk Allocation	20%	2	0.4	4	0.8	5	1
Flexibility	15%	5	0.75	2	0.3	3	0.45
Negotiability	10%	3	0.3	3	0.3	4	0.4
Total	100%		2.85		4.15		3.75

Based on the evaluation results using the Kepner-Tregoe Decision Analysis approach, all alternatives have met the must criteria, so the selection of the strategy is entirely determined by the relative performance against the want criteria.

The results indicate that the fixed-per-barrel tariff offers the most consistent financial performance, while the ICP-linked tariff presents significant revenue volatility. The hybrid tariff provides a balance but requires significant adjustments to achieve financial viability.

CONCLUSION

This study concludes that the key to maintaining the viability of the TS Segment's oil transportation business lies in adopting a fixed-per-barrel tariff model, which offers superior revenue stability and financial viability compared to other alternatives like the ICP-linked or hybrid tariffs. The current commercial model, which is highly dependent on oil prices, does not align with the fixed-cost nature of pipeline operations, leading to volatility and increased risk. Strengthening contract mechanisms, such as long-term capacity commitments and the ship-or-pay structure with defined flexibility provisions for shippers under agreed conditions, is crucial for mitigating volume risks, ensuring revenue certainty, and maintaining commercial attractiveness for both parties. Overall, the combination of a stable tariff structure and robust contract design is essential for ensuring the TS Segment's long-term sustainability in the face of declining volumes and external market fluctuations.

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