RESEARCH ARTICLE

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Navigating Upstream Indonesia's Oil and Gas (O&G) Services Industry Amidst the Cleaner Energy Transition Era with A Scenario Planning Framework

Leonora Ludwina Lilasari and Manahan Siallagan

ABSTRACT

The global movement for a cleaner energy environment has continuously grown and has become unstoppable. It causes the large carbon-producing sectors, such as the Oil and Gas (O&G) industry, to be under intense pressure to immediately reduce their carbon footprint and to immediately produce cleaner energy sources. Therefore, the business players involved, such as the O&G services industry, need to make the urgent decision to reassess its current business strategy. However, to make the right decision, it needs to have a forward-looking scenario of how the industry will evolve in the middle of the cleaner energy transition era. In this situation, scenario planning becomes essential, as it provides a valuable tool to analyze potential future dynamics regarding the dynamics of the O&G landscape, what drives them, and the impacts they may have. In this research, the researcher developed scenario planning based on the interview involving Indonesia's O&G stakeholders, such as the representative of O&G services companies, operators, regulatory bodies (ESDM and SKK Migas), and energy analyst.

The result of scenario planning indicates four possible scenarios for Indonesia's O&G industry in the future, resulting from the interplay between Indonesia's Government Regulation, Incentive / Tax Regimes, with Technological Advancement. These scenarios are Laggard in Cleaner Energy Transition, Vanguard in Cleaner Energy Transition, Stagnation in Cleaner Energy Transition, and Revolution in Cleaner Energy Transition. In the end, the author proposed a business strategy that fits each scenario. The proposed strategy focuses on reassessing the investment scheme, core competencies, strategic partnership, business model, and organization cultures and identity. Thus, by implementing this strategy, the O&G Services industry is expected to thrive, regardless of whichever scenario happens in the future.

Keywords: Business Strategy, Emission Reduction, Oil and Gas Services Industry.

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I. Introduction

The world faces a climate crisis due to Carbon Dioxide (CO2) and other greenhouse emissions from human activities. These emissions, therefore, relate directly to the increase in the earth's global temperature. Historically, the world experienced a gradual rise in temperature from the frequent coal combustion in the industrial era. Even so, the temperature is not higher than the one in the second half of the 29th century, which occurred due to a significant increase in CO_2 emission. Therefore, if the human activities that produce a large carbon footprint remain the same, the world would soon experience a catastrophe.

This fact has opened the eyes of the international community. Together they work hand in hand in various actions to tackle the climate crisis issue. One of these actions is active involvement in international treaties regarding carbon emission reduction, including Paris Agreement in 2015. There are two main objectives of this agreement; these are: limiting global warming to below 2 degrees Celsius above the pre-industrial levels and accelerating the effort to limit the temperature increase to 1.5 degrees Celsius. In this event, each participating country submitted a Nationally Determined Contribution (NDC) outlining their emission reduction targets and strategies.

Besides that, the output of the Paris Agreement has also encouraged the acceleration of cleaner energy sources, which also affects the industry like the O&G industry. It is because the O&G industry, in its operation, released a significant amount of carbon footprint. The data shows that the O&G industry releases 5200 million tons (Mt) of equivalent CO_2 (International Energy Agency, 2018). Compared to other sectors, the O&G industry is responsible for 9 % of all human-made greenhouse gas (GHG) emissions. Moreover, the combination of O&G direct and indirect emissions will be responsible for approximately 42% of the global emission (McKinsey, 2020). This number is almost half of the overall emission generation.

These facts have put the O&G industry under intense pressure to immediately reduce its carbon footprint and

transition to cleaner energy sources. Unfortunately, this action also resulted in many uncertainties in the O&G industry which include managing the investment and operational cost to afford the decarbonization/transition to cleaner energy.

The Bloomberg NEF data indicates that within the last five years, the major O&G industry's total investment in renewables and decarbonization technology has reached approximately $60 billion**.** It is also expected that global investment in renewable energy will continuously rise, which in the end will also impact the trajectory of the O&G industry in the future.

Whereas, back at home, Indonesia's O&G industry has experienced critical challenges, ensuring undisturbed energy security while producing the O&G in much cleaner ways. Therefore, the O&G companies have responded to these challenges by taking several measures.

Take for example, Indonesia's National Oil Company, PT Pertamina has committed to allocate 14% of its Capital Expenditure (CAPEX) budget for clean and renewable energy development. These CAPEX will be put in the cleaner energy portfolio, low carbon technology implementation, and low carbon fuel / green power generation. The other IOC operates in Indonesia also take similar strategic action to ensure continuous operation, while also complying with environmental protection.

As the O&G operators have sought opportunities beyond their traditional oil and gas market to meet changing energy demands, the services industry might also follow similar actions. On top of that, the industry might also transform its technology, and business portfolio, or even change its brand to adjust to the changing in the business landscape.

However, to choose the right business strategy, the industry needs to have a forward-looking scenario on how the O&G business landscape will evolve in the middle of the cleaner energy transition era. Only by doing so can they understand the forward-looking business situations, which allows them to assess the current strategy and be resilient and relevant in each possible oil and gas industry future situation.

Considering this necessity, this research aims to develop a business strategy for the O&G services industry to successfully navigate the future business landscape in the cleaner energy transition era. To achieve this objective, scenario planning that describes the future of decarbonization/transition to cleaner energy in Indonesia's oil and gas industry will be generated. By understanding these dynamics, the oil and gas service company will then be able to assess its strategy, to finally thrive in whichever scenario that might be realized in the future. The questions that will be explored in this research are:

1. What are the key driving factors that affect and influence the decarbonization/transition to a cleaner energy environment for Indonesia's upstream O&G industry?
2. What are the possible scenarios that might describe the decarbonization/transition to a cleaner energy environment for Indonesia's O&G industry?
3. With regard to these scenarios, how should the O&G industry service industry adapt and redesign its business strategy to successfully navigate the new era?

II. Literature Review

A. Scenario Planning Concept

The concept of scenario planning has been studied intensively by many researchers and organizations. Back in 2006, Garvin & Levesque emphasized the concept and importance of scenario planning. They believed that scenario planning provides a valuable tool for one organization to analyze potential future dynamics, as well as what drives them, and the impacts that they may have. In addition, scenario planning also promotes awareness and triggers strategic discussion among the stakeholders. Through this discussion, organizations are able to make informed decisions that will enable them to thrive in the future.

In its development, several researchers also believe that the concept of scenario planning cannot be standardized. Fotr, 2014, was also agreed on this point. In the research, Fotr believed that there is a wide variation of scenario planning concepts. This variation is mainly raised due to the various ways of decision aspects being incorporated into the scenario, which in the end will also trigger the variation in the implementation. The process of scenario planning involves combining potential future outcomes with the dynamics of the external environment, which is often beyond or partially influenced by the decision-maker.

The timeframe selection of scenario planning also becomes an important discussion among the researchers. Ceres (2016) believed that the time frame should be set reasonably, therefore allowing the method to accurately picture potential future situations within that time frame. By doing so, a corporate executive is able to come up with a strategic plan under various operational strategies and external factors influence.

Many researchers have been focused on determining the degree of uncertainty and impact of the scenario planning process. One of the researchers, Dean (2019), emphasized that scenario planning's objective is not to provide precise prediction of the future, but rather to generate a range of potential future scenarios.

Therefore, the scenario planning process should aim to increase the awareness of policymakers and business leaders regarding emerging trends, crucial factors, and influential stakeholders that could lead to significant changes in the current landscape. By exploring these different anticipated future conditions, scenario planning helps uncover previously unidentified opportunities and threats. Its purpose is to equip decision-makers with a broader perspective, enabling them to proactively respond to and capitalize on future circumstances.

B. Developing Business Strategy from Scenario Planning

The application of scenario planning to design a business strategy has been studied intensively by many researchers and organizations. Back in the era of 1970, scenario planning has been performed by Royal Dutch / Shell. Since this era, scenario planning has always been an important tool to determine strategic investment in this company. This scenario planning was further enhanced with the market and competitive analysis, which resulted in the generation of Shell's business strategy. By far, scenario planning has always significantly influenced the strategic decision-making process, particularly in understanding the transition of global energy shares.

By incorporating scenarios into its business strategy, Shell acquires a deeper knowledge of how the energy industry will evolve over time. Therefore, enhancing their understanding related to the potential impact on their investment decision. The use of scenarios, along with the other analytical tools, allows Shell to make robust strategic decisions that align with its long-term objectives.

To be able to illustrate future events, scenario planning must be designed in a proper time frame. It was further emphasized by Fotr (2014) that time frame will also influence the result of strategic planning within the organization. The planning horizon is typically midterm, although this may vary depending on the nature of the business and economic cycles. Scenario planning should also contain sufficient breadth and depth of the issue discussed.

Meanwhile, the application of scenario planning for business strategy generation has also been discussed by several researchers. Cornelius (2015) emphasized that scenarios are not just predictions of the overcoming of futures. However, scenarios are trusted alternative narrations of the future business condition. The company should use the scenario to assess its current plans, test its business assumption, and more importantly generate business strategies to strive in the future.

Schoemaker (2016) states that by understanding the scenario, the executive management of a company might get a significant advantage, particularly to sense the possible business opportunity in the first place. Unfortunately, he also mentioned that this approach is not quite often used in many companies worldwide.

Ceres (2017) indicates that by employing scenario planning, corporate leaders can examine and devise strategies for different potential futures resulting from the scenario process. Therefore, its businesses players evaluate the project outcomes, associated with various operational strategies and a broader spectrum of economic, social, and regulatory factors.

III. METHODOLOGY

A. *Scenario Planning Framework*

Scenario planning is indeed a diverse field with various methodologies and approaches. The literature review suggests that there is no single approach to scenario planning, but rather multiple methodologies with shared characteristics.

In general, scenario-building techniques emphasize determining several components that compose the possible future of a company/organization, which may include:

- *Defining the focal Issue*: The first step of scenario planning is to identify the key issues/factors that are relevant to the scenario planning exercise. Scenario planning should include strategic uncertainty in the focal issue. By incorporating strategic uncertainty, organizations can explore a range of possible futures and prepare themselves to navigate through various challenges and opportunities.
- *Identifying the Driving Forces*: Once the issues are defined, the next step is to identify the key drivers or forces that influence those issues. These drivers can be internal or external to the system being analyzed. Understanding the key drivers helps in understanding the underlying dynamics that shape future outcomes.
- *Identifying the Critical Uncertainties*: Once the driving forces have been identified, they are ranked and evaluated based on their importance and uncertainty. Importance refers to the level of significance or impact to particular driving forces, while uncertainty relates to the level of unpredictability or lack of knowledge about the future state of those forces. This analysis helps prioritize the factors and focus on those that are most critical and uncertain.
- *Defining Scenario Framework*: Critical uncertainties and driving forces that have been identified, will then be plotted into the matrix of uncertainties. There will be four distinct quadrants for exploration.
- *Developing the Scenarios*: When exploring the scenario framework and critical uncertainties using the matrix of uncertainties, different future plans can be developed for each quadrant. The specific plan will depend on the nature of the uncertainties and the context of an organization.
- *Developing the Narratives*: Once the scenarios have been identified with the critical uncertainty framework, they can be further explored and developed into narrative stories. These narratives should be coherent and consistent, capturing the key elements and dynamics of each scenario.
- *Defining the Implications*: After developing the scenarios and narratives, then the other critical step is to define the implications. These implications need to involve various aspects such as strengths, vulnerabilities, alternative strategies, and capabilities.
- *Defining the early warning signals*: Identification of critical indicators that can effectively signal the probable emergence of a scenario over the others.

Interaction within the components in Scenario Planning Process is illustrated in (Fig. 1) below:

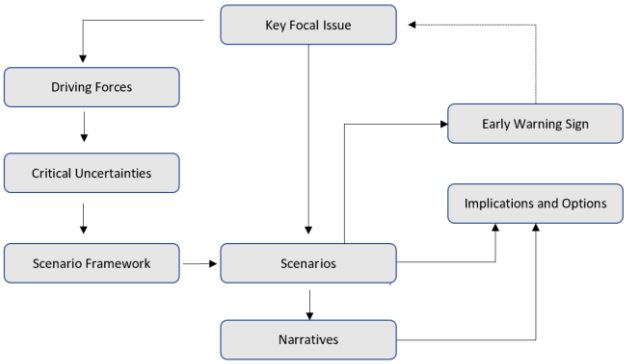

Fig. 1. The workflow to incorporate scenario planning in an organization's strategic planning (Dean, 2019).

The process of scenario planning will involve key stakeholders of the organization to provide key information and include the following steps: orientation, exploration, scenario creation, identification of options and implications, and integration into the current management process, as illustrated in Fig. 2 below:

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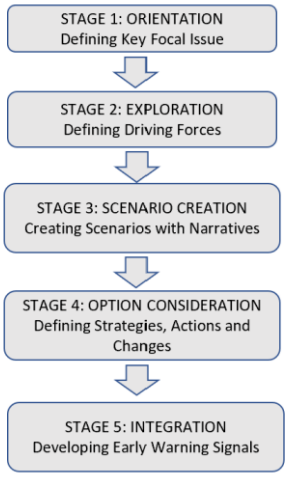

Fig. 2. Scenario planning stages (Rothaermel, 2017).

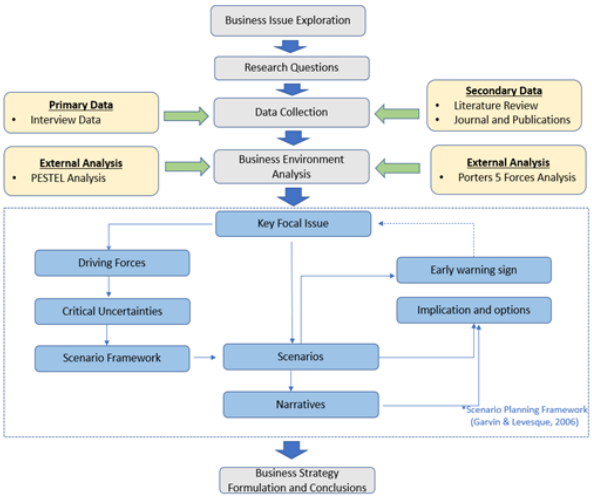

Fig. 3. Research Design (Authors' Illustration, 2023).

B. Research Design

The research design illustrates every process and aspect of this research. The process will be organized into a relatable framework to fulfill the research objectives and questions that should be discovered using analysis methods, suitable assumptions, and key findings.

This research started the formulation of research questions. Then after the research question, the author examines the appropriate data collection methodology from primary and secondary data. In this research, the primary data included the interview involving the O&G stakeholders, such as the representative of O&G services companies, O&G operators, O&G regulators (ESDM and SKK Migas), and professional energy analysts. In-depth interviews with each stakeholder serve multiple purposes, such as gathering their current view about what is important that is going on now and might be happening in the O&G industry in the future. Besides that, from the interview, the author would also get a sense of the stakeholder's concerns and what are they hope / expectations to accommodate those concerns. In this research, the secondary data is collected through literature reviews, a published journal, and institutional annual reports within the O&G industry.

From this data collection, the author inserts external analysis, which includes PESTEL and Porter's five forces to analyze the factors that may create opportunities and threats for the upstream O&G services industry. This external input will then determine the business environment in this research

After analyzing this business environment, the author will conduct scenario planning. The author believes that the scenario planning method would be beneficial to get an accurate picture and creating the possible future scenario for the upstream O&G industry in Indonesia. From this scenario, the author developed the narratives to understand the implication of each scenario. The option and early warning signals are developed for each scenario that is further used as input for business strategy and implementation development for the upstream O&G services industry.

One thing to emphasize, the business strategy recommendation in this study is not specifically designed for one specific company but rather to be developed in the general upstream O&G services companies.

The research design is illustrated in Fig. 3 below:

C. Data Collection Method and Analysis

In this research, the data analysis that will be used is a qualitative approach. As discussed earlier, this research uses primary data from in-depth interviews and questionnaires with the oil and gas stakeholders, such as the representative of O&G services companies, O&G operators, O&G regulators (MEMR and SKK Migas), and professional energy analyst. All of these respondents were selected based on their strategic roles and function as stakeholders. This primary data will be completed with the secondary data that comes from a literature review, a published journal, and institutional annual reports, to get a holistic understanding of the problem assessed in this research.

IV. Result and Discussion

A. Key Focal Issue

The first step of scenario planning is to define the key focal issue. In this research, the key focal issue that became the basis of scenario planning development is "How will Indonesia's upstream O&G sector evolve in 2030 due to the transition to a cleaner energy environment? "By answering the key focal issue, it is expected to provide the O&G industry to look into the future and reassess its current business strategy to thrive in whichever scenario that will be realized.

B. Driving Forces

The second step of scenario planning is to investigate and categorize the driving forces. These driving forces encompass a range of factors, situations, and strategies that have the potential to impact, influence and shape the key focal issue. The identification of these driving forces is established through primary data collection, which involves conducting interviews with key stakeholders, as well as secondary data collection through the examination of relevant documents and literature research.

Through these examinations, a total of fifteen (15) driving forces have been identified that have the potential to drive the oil and gas industry to a cleaner energy environment. These driving forces span various domains. including political, economic social, technological, environmental, and economic aspects. Their collective influence will play a crucial role in determining the trajectory and outcomes of the

TABLE I: KEY DRIVING FORCES FOR INDONESIA'S O&G INDUSTRY IN THE FUTURE

Category	Key Driving Forces
Political	Geopolitical Condition
	Strategic Collaboration
	Nationally Determined Contribution Fulfillment
Economy	O&G Demand
	O&G Investment
	RE Investment
	O&G Production
	Facility and Infrastructure Development
	Energy Economics / Affordability
	O&G Operational Efficiency
Socio-Cultural	Qualified Human Capital / Expertise in Clean Energy Domain
	Public Awareness of Climate Issue
Technological	RE Technology Advancement
	O&G Low Carbon Technology Advancement
Legal	Government Low Carbon Law / Policy Enforcement

O&G industry in Indonesia moving forward. The details of these driving forces are listed in Table I.

C. Critical Uncertainties

The driving forces identified in the previous section were then assessed based on their degree of uncertainty and impact on the key focal issue. The driving forces with the highest impact but the most uncertainty are classified as critical uncertainties. The determination of the degree of uncertainty and impact is achieved through a scoring process conducted during the interviews.

In order to do so, during the interview, the respondents were asked to select only 5 critical driving forces. Then they should give a score from 1-5 regarding the impacts and uncertainty of these driving forces, with 1 being the lowest impact / lowest uncertainty, and 5 being the highest impact / highest uncertainty. From this exercise, the author came up to the conclusion that the top driving forces that most affected the key focal issue are: ***Government Law Enforcement; Incentive and Tax Regime; and O&G Technology Advancement.*** However, since the two first driving forces are coming from a legal perspective, these forces can be combined and analyzed under one category, which is: ***Government Law Enforcement and Incentive & Tax Regime***. These two critical factors would then be used for scenario creation.

D. Scenario Creation

During this stage, the scenario framework will be constructed by crafting detailed descriptions and narratives that outline the key characteristics, trends, and events within each scenario. The aim is to create scenarios that are persuasive and provide a comprehensive understanding of possible future development.

As already mentioned in the previous stage, the two most critical uncertainties are: ***Government Law Enforcement, O&G Technology Advancement, and Incentive and Tax Regime***. These 2 main drivers are then plotted in 2 cross axes, with the horizontal axis showing technological advancement, and the vertical axes showing government law enforcement and incentive and Tax Regime. There are then 4 scenarios created in each quadrant. These scenarios are further illustrated in the Fig. 4 below:

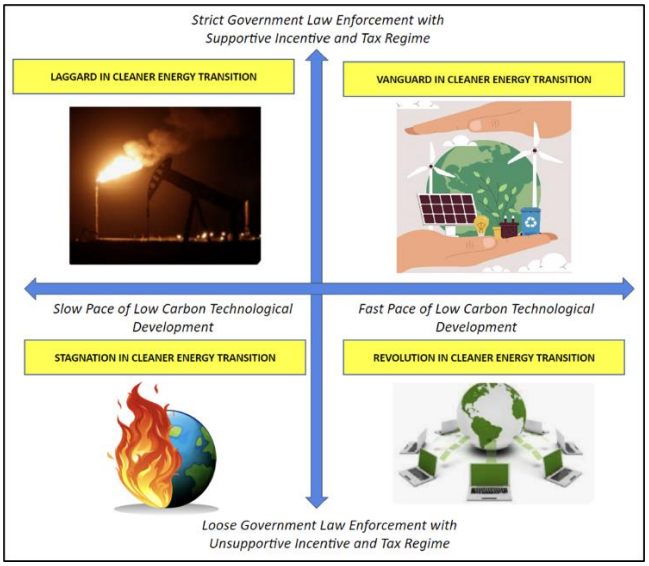

Fig. 4. Scenario Creation in 2×2 Matrix based on the Identified Critical Uncertainties.

E. Scenario Narrative, Business Implications and Options /Business Strategy

During this stage, the scenario framework will be constructed by crafting detailed descriptions and narratives that outline the key characteristics, trends, and events within each scenario. The aim is to create scenarios that are persuasive and provide a comprehensive understanding of possible future development.

Besides that, in this section, there will also be a discussion on business implications and strategy/options to thrive in each scenario.

Scenario 1 – Laggard in Cleaner Energy Transition; Scenario Narratives

Scenario No.1 highlights the situation in which Indonesia's Government has implemented rigorous policies and regulations to further accelerate the energy transition and fulfillment of NDC. Unfortunately, this is not supported with sufficient/fit-to-purpose low-carbon technological development/implementation, which eventually hinders the progress of energy transition moving forward.

With strict government support and a supportive incentive/tax regime, the O&G operators have a strong willingness to transition to a cleaner energy environment. The investment in clean technology development is predicted to increase in this scenario. Unfortunately, the O&G operators might not have the right expertise and strategic collaboration with the other parties, such as academia, services company, and the national research board, hence these efforts are not able to accelerate the generation of low-carbon technological development. As a result, the technology in this scenario is limited, with the high cost of installation and maintenance. Considering this high cost, the technology that exists today, such as Carbon Capture and Storage (CCS) is also not broadly implemented.

The O&G operators also seek the opportunity to diversify their business. They will put the RE sector as the top priority to diversify their business, considering that there are strict law enforcement and supportive regimes. Unfortunately, the business diversification will not be successfully executed as

there is an issue related to technology availability which influences the profitability element.

All these dynamics finally result in the continued reliance on fossil fuels and a slower reduction in carbon emissions. Therefore, the government's target to achieve the NDC's mid-term target in 2030 and the NZE target in 2060 is most likely to be delayed.

Scenario 1 – Laggard in Cleaner Energy Transition; Business Implications

This scenario has some business implications as listed below:

- The slow pace of technological development hampers the adoption and integration of low-carbon technologies. These facts in the end resulted in the continued reliance on fossil fuels and a slower reduction in carbon emissions. The government's target to achieve the NDC's midterm target in 2030 and the NZE target in 2060 is most likely to be delayed.
- The O&G 's current core competencies and expertise are still relevant in this scenario. It is also expected that the revenue portion from the O&G business is within the range of 60-80%.
- With strict government support and a supportive incentive/tax regime, the O&G operators have a strong willingness to transition to a cleaner energy environment.
- The O&G operators will seek carbon reduction in their current operation. This may not be in the form of advanced technology, but rather making the operation becomes more efficient so that the carbon emission might be lowered.
- The investment in clean technology development is predicted to increase in this scenario. Unfortunately, the O&G operators might not have the right expertise in low-carbon technology development. Therefore, they are most likely looking for a strategic partnership with the O&G services company in this area, which might open the new market opportunity
- The O&G operators also seek the opportunity to diversify their business. They will put the RE sector as the top priority for diversification. Unfortunately, the business diversification will not be successfully executed as there is an issue related to technology availability which influences the profitability element. This fact also opens a new market opportunity for O&G Services company to provide the technology in the RE sector

Scenario 1 – Laggard in Cleaner Energy Transition; Business Strategy / Options

To be able to adapt and successfully navigate Scenario #1. The O&G services industry should consider several options below in the re-assessment of its business strategy. These options include:

- As the O&G services' core competency is still relevant in this scenario, the industry should be strengthening its competency in O&G. The O&G industry shall also bring value through much more efficient ways of working. This will infect lower the emission in the O&G operational area, without using advanced low-carbon technology.
- Start to allocate the investment from the core O&G business to develop/diversify the business portfolio in clean energy (RE), this may include technology generation, human resource development, and other operational-related matters.
- Start to re-assess its core competency, including the technology, people, and operational capability. Ensure that these core competencies are relevant and applicable to the clean energy era.
- Form a strategic partnership with the O&G operators and other academic / research institutes. That way, the low-carbon technology generation will be accelerated. Besides that, through this strategic partnership, the services industry might understand the client's needs/challenges better.

Scenario 2 – Vanguard in Cleaner Energy Transition; Scenario Narratives

Scenario No 2 highlights the most optimistic condition, where Indonesia's O&G industry is experiencing rapid transformation, driven by the fast pace of technological development, strong government support, and supported incentives/tax regimes.

As technology advancement is advanced progressively, this enables the O&G industry to adopt cleaner practices and rescue emissions at an accelerated rate. The breakthroughs in RE technology, such as solar, wind, and geothermal have opened the opportunities for energy production and integration. Meanwhile, low carbon technology, such as carbon capture, utilization, and storage (CCUS) technologies have also gained prominence, allowing O&G operators to mitigate their carbon footprint effectively.

The government also plays a critical role in driving the transformation, providing support, and creating an enabling environment for the industry. Strong policy frameworks, regulations, and targets are in place to incentivize the adoption of low-carbon technologies.

The O&G operators in Indonesia are embracing the advancement of technology and government support to diversify their portfolios and adapt to the changing energy landscape. They are investing in research and development, partnering with oil and gas service providers, and integrating clean energy solutions into their operations.

All these dynamics finally result in a conducive environment for the transition to cleaner energy sources. This accelerated transition can lead to a substantial reduction in greenhouse gas emissions, therefore the NDC Midterm target as well as the NZE target can be achieved faster than the plan.

Scenario 2 – Vanguard in Cleaner Energy Transition; Business Implications

This scenario has some business implications as listed below:

- In this scenario, Indonesia's O&G industry is experiencing rapid transformation, driven by the fast pace of technological development, strong government support and supported incentives/tax regime. All these

dynamics finally result in the accelerated transition pace. Therefore, the NDC Midterm target as well as the NZE target can be achieved faster than the plan. Besides that, the demand for O&G keeps decreasing significantly.

- Therefore, O&G's current core competencies and expertise are not having significant relevance anymore in a fully transitioning environment. The predicted revenue portion from the O&G business is <20%.
- Without the advancement of technology and lack of government support, the O&G operators are not interested in putting much effort into changing the way they operate. There will not be many changes in the business operation as today.
- O&G operators in Indonesia are embracing the advancement of technology and government support to diversify their portfolios and adapt to the changing energy landscape.
- The research and development efforts to generate low-carbon technology are massively performed. Therefore, relates to the lower cost of technology implementation. In this scenario, the low-carbon technology, such as CCUS will be implemented broadly within the O&G operation.

Scenario 2 – Vanguard in Cleaner Energy Transition; Business Strategy / Options

To be able to adapt and successfully navigate Scenario #2. The O&G services industry should consider several options below in the re-assessment of its business strategy. These options include:

- With the massive adoption of low-carbon technology and strong government support, the oil and gas industry will move to a cleaner energy environment. Therefore, the O&G service industry to diversify itself. They should penetrate renewable energy services, energy efficiency solutions, carbon capture and storage, and other emerging areas.
- The fast pace of technological development in this scenario necessitated the adoption of digital solutions and technology. Therefore, the O&G services industry should update its offering into advanced data analytics, remote monitoring and control systems, and other digital tools that will optimize workflows and enable better decision-making.
- Related to business portfolio diversification, renewable services were not belonging to the core competency of service companies. Therefore, the company should consider the merger and acquisition with another company that is focused on delivering the core competency in the new market
- The O&G service company was first established to cater to the oil and gas energy company. However, with the changing in the energy business landscape and the range of services that it provides, the company should also consider "Rebranding" dan "Reorganisation" to better adapt to the evolution of O&G to cleaner energy.

Scenario 3 – Stagnation in Cleaner Energy Transition; Scenario Narratives

Scenario No 3 is the most pessimistic scenario. In this scenario, Indonesia's O&G industry faces significant hurdles due to the slow pace of technological development, and loose and non-supportive government regulation. This situation presents a challenging environment for industry players as they navigate obstacles in their transition toward cleaner and more sustainable practices.

The pace of technological advancement in low-carbon solutions is hindered by various factors, including limited research and development investment, a lack of innovation incentives, and a fragmented technology landscape. As a result, the industry struggles to adapt and integrate cutting-edge technologies that can significantly reduce emissions and enhance sustainability.

Government support in this scenario is relatively weak, with policies and regulations lacking the necessary rigor and clarity to drive the industry's transformation. In addition, the absence of a clear roadmap or ambitious targets creates uncertainty, making it difficult for O&G operators to plan and invest in sustainable initiatives. No supportive incentives and tax regimes further exacerbate the challenges, providing little motivation for companies to prioritize low-carbon practices.

All these dynamics finally result in a high dependency on fossil fuels, which further contributed to the increasing environmental concern and carbon emissions. Therefore, the government's target to achieve the NDC's midterm target in 2030 and the NZE target in 2060 are most likely to be significantly delayed / never achieved.

This scenario is also describing the slowest pace of cleaner energy transition, if compared to the other three generated scenarios.

Scenario 3 – Stagnation in Cleaner Energy Transition; Business Implications

This scenario has some business implications as listed below:

- In this scenario, Indonesia's O&G industry faces significant hurdles due to the slow pace of technological development, and loose and non-supportive government regulation. All these dynamics finally result in a high dependency on fossil fuels, which further contributed to the increasing environmental concern and carbon emissions. Therefore, the government's target to achieve the NDC's midterm target in 2030 and the NZE target in 2060 are most likely to be significantly delayed / never achieved.
- The O&G 's current core competencies and expertise are still completely relevant in this scenario. It is also expected that the revenue portion from the O&G business is within the range of 40-60%.
- In the absence of strong government support and incentive, the oil and gas company may reduce the clean energy research and development efforts within the industry. Oil and gas companies may allocate fewer resources to exploring and developing new technologies, innovative processes, and sustainable solutions.
- Without the advancement of technology and lack of government support, the O&G operators are not interested in putting much effort on changing the way

they operate. There will not be many changes in the business operation as today.

Scenario 3 – Stagnation in Cleaner Energy Transition; Business Strategy / Options

To be able to adapt and successfully navigate Scenario #3, the O&G services industry should consider several options below:

- The industry should be strengthening its competency in the O&G industry. They should bring value through much more efficient ways of working. This will in fact lower the emission in the O&G operational area, without using advanced low-carbon technology.
- Start to allocate the investment from the core O&G business to develop/diversify the business portfolio in clean energy (RE), this may include technology generation, human resource development, and other operational-related matters.
- Start to re-assess its core competency, including the technology, people, and operational capability. Ensure that these core competencies are relevant and applicable to the clean energy era.
- There will not be many changes in the business operation as today. However, the O&G service industries should also revolutionize the way the oil and gas operators work, by providing a new method that leads to efficiency.
- Form a strategic partnership with the O&G operators and other academic / research institutes. That way, the low-carbon technology generation will be accelerated. Besides that, through this strategic partnership, the services industry might understand the client's needs/challenges better.
- Reassess the target and engage more with the International Oil Company Client. The support from the Indonesian Government might be low, and this may also relate to the National Company. However, International Oil Company follows the global ambition, which has moved to a cleaner energy environment.

Scenario 4 – Revolution in Cleaner Energy Transition; Scenario Narratives

Scenario 4 highlights the situation in which the oil and gas industry in Indonesia finds itself during a technological revolution characterized by a fast pace of technological development. However, in this scenario, the government law enforcement is loose, and the government also provides no supportive incentives/taxes. Considering this, the O&G operators might have less motivation to implement advanced, yet costly low-carbon technological solutions in their O&G operations. Therefore, this scenario presents a complex and dynamic landscape of transition to a cleaner energy era.

In this scenario, the technological advancement in low-carbon solutions occurs at an accelerated rate, offering a wide array of options for the industry to reduce emissions and transition toward cleaner energy sources. Innovation in renewable energy transitions, energy storage systems, and carbon capture techniques present opportunities for operators to enhance their sustainability performance.

In the absence of strict government enforcement, industry players take ownership of their sustainability initiatives and drive change from within their organizations. They invest in their workforce, promoting a culture of innovation, sustainability, and continuous improvement. They seek to optimize their operations by implementing energy-efficient practices, adopting cleaner technologies, and exploring alternative energy sources.

All these dynamics finally impact the transition to a cleaner energy environment. With the less supportive government regulation and incentive/tax regime, the transition pace will experience acceleration, but it will be at a slower pace. Therefore, the NDC Midterm target as well as the NZE most likely be slightly delayed.

Scenario 4 – Laggard in Cleaner Energy Transition; Business Implications

This scenario has some business implications as listed below:

- Scenario 4 highlights the situation in which the oil and gas industry in Indonesia finds itself during a technological revolution characterized by a fast pace of technological development. However, in this scenario, the government law enforcement is loose, and the government also provides no supportive incentives/taxes. Considering this, the O&G operators might have less motivation to implement advanced, yet costly low-carbon technological solutions in their O&G operations.
- The O&G 's current core competencies and expertise are still relevant in this scenario. It is also expected that the revenue portion from the O&G business is within the range of >80%.
- In this scenario, the technological advancement in low-carbon solutions occurs at an accelerated rate, offering a wide array of options for the industry to reduce emissions and transitions toward cleaner energy sources. Innovation in renewable energy transitions, energy storage systems, and carbon capture techniques present opportunities for operators to enhance their sustainability performance.
- In the absence of strict government enforcement, industry players take ownership of their sustainability initiatives and drive change from within their organizations. They invest in their workforce, promoting a culture of innovation, sustainability, and continuous improvement. They seek to optimize their operations by implementing energy-efficient practices, adopting cleaner technologies, and exploring alternative energy sources.

Scenario 4 – Laggard in Cleaner Energy Transition; Business Strategy / Options

To be able to adapt and successfully navigate Scenario #4, the O&G services industry should consider several options below:

- Strengthening the core competency in Oil and Gas, by developing more efficient solutions. With a lack of government support, the oil and gas operator will be

reluctantly implementing the high capital low carbon technology. Therefore, they would still prefer to apply the technology in their operation with low-cost capital and enhance their efficiency and optimization in their operation.

- The fast pace of technological development in this scenario necessitated the adoption of digital solutions and technology. Therefore, the O&G services industry should update its offering into advanced data analytics, remote monitoring and control systems, and other digital tools that will optimize workflows and enable better decision-making.
- Related to business portfolio diversification, renewable services were not belonging to the core competency of service companies. Therefore, the company should consider the merger and acquisition to another company that are focused on delivering the core competency in the new market
- Form a strategic partnership with the O&G operators and other academic / research institute. That way, the low carbon technology generation will be accelerated. Besides that, through this strategic partnership, the services industry might understand the client needs / challenges better.
- Reassess target and engage more with the International Oil Company Client. The support from the Indonesian Government might be low, and this may also relate to National Company. However International Oil Company follows the global ambition, which has moved to a cleaner energy environment.

F. Early Warning

Signals are noteworthy elements that deserve attention as they may signify the beginning of the future described in one of the scenarios. Early warning signals enable us to observe and analyze the driving forces in the environment, providing insights into whether we are moving toward one scenario or another. Early warning signals revolve around the early identification of signs of change, emerging trends, and shifts in relation to the previously conducted scenario work. In this context, the leading indicators and signposts for each scenario are listed in Table II.

V. Conclusions and Recommendations

A. Conclusions

This research has shown the application of scenario planning to derive a business strategy for the O&G industry to thrive amid the cleaner energy transition era. The result of this analysis has also provided an understanding related to the future dynamics of O&G operations, the driving forces behind them, and the potential impacts. Through informed decision-making derived from scenario planning, the O&G services industry is able to make the proper business strategy and thrive, in whichever situation may emerge in the future.

As inferred from the study, there are fifteen key driving forces that drive the Indonesian O&G industry in the future. These driving forces encompass Political, Economic, Social, Technological, and Legal Factors. The analysis also shows that there are four possible scenarios for Indonesia's O&G industry in the future, resulting from the interplay between Indonesia's Government Regulation, Incentive/Tax Regimes with Technological Advancement. These scenarios are Laggard in Cleaner Energy Transition, Vanguard in Cleaner Energy Transition, Stagnation in Cleaner Energy Transition, and Revolution in Cleaner Energy Transition.

From these scenarios, the proposed business strategy can also be deducted. This proposed strategy focuses on the re-assessment of the investment scheme, core competencies, strategic partnership, business model, and organization cultures and identity.

Thus, by implementing this strategy, the O&G Services industry is expected to thrive, regardless of whichever scenario may be realized in the future.

B. Recommendations

The O&G Services industry should see the conditions in all scenarios as business opportunities, rather than threats. Based on the interview, many stakeholders feel that the government regulation is currently not supportive to accelerate the transition to cleaner energy. However, many believe that the technology will be advancing in the near future. Thus, without critical government intervention, the O&G trajectory will move towards Scenario 4, Revolution in the Cleaner Energy Transition. Considering this, here are several recommendations for the O&G Services industry to thrive in the scenario:

- Improve financial capabilities, to be invested in the generation of fit-to-purpose low-carbon / renewable energy solutions.
- Diversification of business portfolio and services offering, with digital as the backbone.
- Instilling innovation culture, as the technology development will be advanced within a short period of time.

TABLE II: Early Warning Parameters for Each Scenario

Indicators	Laggard	Vanguard	Stagnation	Revolution
O&G Revenue Percentage	60 – 80%	<20%	>80%	40-60%
Government Policy Regulation and Low-Carbon Law Enforcement	Incentives (such as carbon tax), increase at the expected level.	Incentives (such as carbon tax) are successful and increase at the expected level.	Incentives (such as carbon tax), remain at a minimum level.	Incentives (such as carbon tax), remain at a minimum level.
	Law enforcement is Strict.	Law enforcement is Strict.	Law enforcement is loose and faces a significant barrier.	Law enforcement is loose and faces a significant barrier.
Share of O&G within Primary Energy Mix	60-70%	<50%	>70%	50-60%
Low Carbon Technology Advancement	Widely available, reasonable cost due to significant RnD efforts	Limited, and expensive due to lack of RnD efforts.	Widely available, reasonable cost due to significant RnD efforts	Limited, and expensive due to lack of RnD efforts.

- Form a strategic partnership with other pioneer technology companies.
- Re-asses potential clients and engages more with the International Oil Company Client. The support from the Indonesian Government might be low, and this may also relate to the National Company. However, International Oil Company follows the global ambition, which has moved to a cleaner energy environment.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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