

**SCENARIO PLANNING FOR STRATEGIC DECISION-
MAKING IN CAPTIVE POWER PLANT: A CASE STUDY OF
PT KPC FACING GLOBAL NET ZERO EMISSION
CHALLENGES BEYOND 2031**

FINAL PROJECT

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for the master's degree
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ABSTRACT

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PT Kaltim Prima Coal (KPC) faces significant challenges with its captive power plant amidst Indonesia's commitment to achieving net zero emissions by 2060. Various driving forces is creating uncertainty and impacting the sustainability of KPC's coal-fired power plant. This study addresses these challenges by employing a comprehensive scenario planning approach to identify critical uncertainties, develop plausible future scenarios, and propose actionable strategic recommendations. The aim is to provide KPC with a robust framework to navigate these uncertainties while ensuring compliance with evolving regulations and maintaining operational efficiency.

The research objectives are to pinpoint the driving forces that lead to uncertainty, create plausible scenarios for KPC's future operations, and formulate strategic recommendations. A qualitative methodology is used, integrating primary data from surveys, interviews, and focus group discussions with secondary data from government publications, academic journals, and industry reports. The scenario planning process follows five stages: orientation, exploration, scenario creation, consideration, and integration. This approach identifies two critical uncertainties—coal price fluctuations and carbon regulation variations—which form the basis for four scenarios: Double-Edged Sword, Silver Lining, Perfect Storm, and Golden Era. Each scenario provides unique implications for KPC's operations, financial stability, and regulatory compliance.

The study's findings suggest that enhancing operational efficiency, adopting biomass co-firing, and engaging in carbon credits and offset projects are viable strategies across all scenarios. These strategies aim to reduce costs and emissions, leverage existing infrastructure, and ensure regulatory compliance. This research contributes to strategic management in the energy sector by demonstrating the effectiveness of scenario planning in addressing uncertainties related to climate change and regulatory changes. By implementing these recommendations and monitoring early warning signals, PT KPC's captive power plant can better prepare for future uncertainties, align with Indonesia's Net Zero Emission goals beyond 2031, and maintain resilience and competitiveness during global energy transitions.

Keywords: Scenario Planning, Climate Change, Captive Power Plant, Coal, Uncertainties, Net Zero Emission

ABSTRAK

PERENCANAAN SKENARIO UNTUK PENGAMBILAN KEPUTUSAN STRATEGIS DALAM PEMBANGKIT LISTRIK MANDIRI: STUDI KASUS PT KPC DALAM MENGHADAPI TANTANGAN EMISI NOL BERSIH GLOBAL SETELAH 2031

Oleh

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PT Kaltim Prima Coal (KPC) menghadapi tantangan signifikan dengan pembangkit listrik captive-nya di tengah komitmen Indonesia untuk mencapai emisi nol bersih pada tahun 2060. Berbagai faktor pendorong menciptakan ketidakpastian dan mempengaruhi keberlanjutan pembangkit listrik berbahan bakar batubara KPC. Studi ini menangani tantangan-tantangan tersebut dengan menggunakan pendekatan perencanaan skenario yang komprehensif untuk mengidentifikasi ketidakpastian kritis, mengembangkan skenario masa depan yang masuk akal, dan mengusulkan rekomendasi strategis yang dapat ditindaklanjuti. Tujuannya adalah untuk menyediakan kerangka kerja yang kokoh bagi KPC untuk menavigasi ketidakpastian ini sambil memastikan kepatuhan terhadap peraturan yang terus berkembang dan menjaga efisiensi operasional.

Tujuan penelitian ini adalah untuk mengidentifikasi faktor pendorong yang menyebabkan ketidakpastian, membuat skenario yang masuk akal untuk operasi masa depan KPC, dan merumuskan rekomendasi strategis. Metodologi kualitatif digunakan, mengintegrasikan data primer dari survei, wawancara, dan diskusi kelompok terarah dengan data sekunder dari publikasi pemerintah, jurnal akademik, dan laporan industri. Proses perencanaan skenario mengikuti lima tahap: orientasi, eksplorasi, penciptaan skenario, pertimbangan, dan integrasi. Pendekatan ini mengidentifikasi dua ketidakpastian kritis—fluktuasi harga batubara dan variasi regulasi karbon—yang menjadi dasar untuk empat skenario: Pedang Bermata Dua, Garis Perak, Badai Sempurna, dan Era Keemasan. Setiap skenario memberikan implikasi unik bagi operasi KPC, stabilitas keuangan, dan kepatuhan regulasi.

Temuan studi ini menunjukkan bahwa meningkatkan efisiensi operasional, mengadopsi pembakaran biomassa, dan terlibat dalam proyek kredit karbon dan offset adalah strategi yang layak di semua skenario. Strategi-strategi ini bertujuan untuk mengurangi biaya dan emisi, memanfaatkan infrastruktur yang ada, dan memastikan kepatuhan terhadap regulasi. Penelitian ini berkontribusi pada manajemen strategis di sektor energi dengan menunjukkan efektivitas perencanaan skenario dalam menangani ketidakpastian terkait perubahan iklim dan perubahan regulasi. Dengan menerapkan rekomendasi ini dan memantau sinyal peringatan dini, pembangkit listrik captive PT KPC dapat lebih baik mempersiapkan diri menghadapi ketidakpastian di masa depan, selaras dengan tujuan Emisi Nol Bersih

Indonesia setelah tahun 2031, dan mempertahankan ketahanan serta daya saing selama transisi energi global.

Kata kunci: Perencanaan Skenario, Perubahan Iklim, Pembangkit Listrik Captive, Batubara, Ketidakpastian, Emisi Nol

VALIDATION PAGE

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25 July 2024

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(Dr. Eng. Pri Hermawan, S.T, M.T.)

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This final project is dedicated to parents, wife, children, my beloved family, and my colleagues who always support me.

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LIST OF ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS	Name	Page of initial usage
ASM	Artisanal and Small-Scale Mining	
CCUS	Carbon Capture, Utilization, and Storage	
CFPP	Coal Fired Power Plant	
ESG	Environmental, Social, and Governance	
FGD	Focus Group Discussion	
KPC	Kaltim Prima Coal	
NZE	Net Zero Emission	
NDC	Nationally Determined Contribution	
PESTEL	Political, Economic, Social, Technological, Environmental, and Legal	
UNFCCC	United Nations Framework Convention on Climate Change	

Chapter I Introduction

In this chapter, the background explaining why the topic of this study was selected will be detailed, along with a description of PT Kaltim Prima Coal (KPC) involved. Business issues faced by KPC will be addressed, and the research questions and objectives of this study will be outlined. Additionally, the scope and limitations of the study will be delineated.

I.1 Background

This section outlines the background that has led to the business issue KPC must confront regarding the challenge of net zero emissions in the future. The background begins with the global condition of climate change and extends to its connection with KPC's captive power plant.

I.1.1. Climate Change

Climate is the term used to describe the average weather conditions, including temperature, humidity, and rainfall patterns, that persist over long periods of time, such as seasons, years, or decades. While the meteorological conditions might undergo rapid fluctuations over a span of a few hours, the climate undergoes long-term alterations over extended periods of time. Climate change refers to the substantial alteration of average weather patterns, resulting in long-term shifts such as increased temperatures, precipitation, or aridity. The distinguishing factor between climate change and natural weather variability lies in the longer-term trend (The World Bank Group, 2021).

Between the years 2011 and 2020, there was a noticeable increase of 1.1°C in the global surface temperature compared to the period between 1850 and 1900. This rise is primarily attributed to human activities, specifically the emission of greenhouse gases (Calvin et al., 2023). The primary factor causing climate change is the combustion of fossil fuels, namely oil, gas, and coal, resulting in the substantial emission of carbon dioxide (CO₂) into the atmosphere (Met Office, 2023).

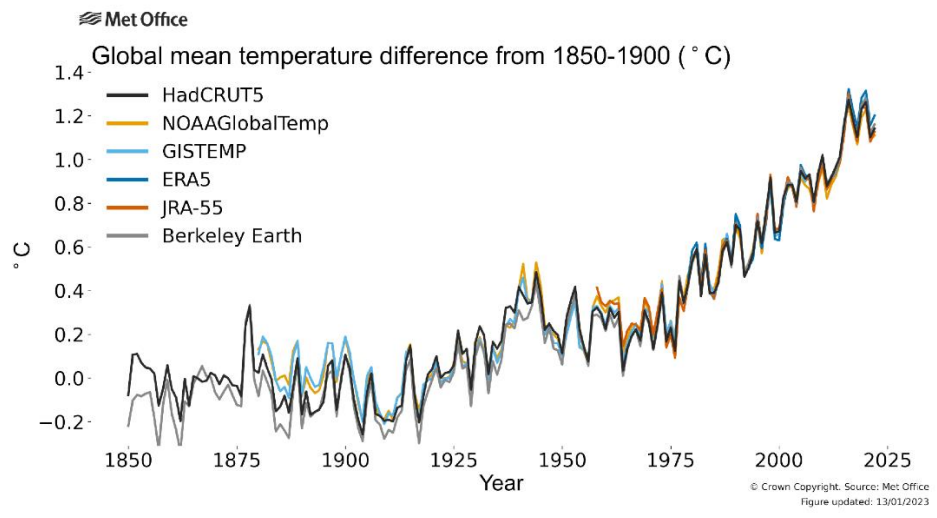


Figure I.1. Global temperature change from 1850 to 2022 (Met Office, 2023).

The single most significant contributor to climate change is coal, which is responsible for approximately forty percent of the world's CO₂ emissions that are caused by energy consumption (Jakob et al., 2020).

I.1.2. Paris Agreement

To enhance the worldwide effort against the peril posed by climate change, the Paris Agreement was carried out. The event was coordinated by the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC, which stands for the United Nations Framework Convention on Climate Change, is a global environmental agreement that was established in 1992 with the purpose of tackling the issue of climate change. The Paris Agreement is an integral component of the UNFCCC and was deliberated upon by 196 participating nations during the 2015 summit held in Le Bourget, near Paris, France (UNFCCC, 2016).

The Paris Agreement is a turning point in the multilateral effort to combat climate change and adapt to its effects because, for the first time, all nations are united under a legally binding agreement to do so. To restrict global warming to 1.5°C, greenhouse gas emissions must fall 43% by 2032 and reach a maximum level before 2025. The agreement is based on a five-year cycle in which countries undertake progressively more ambitious climate action. The Paris Agreement acknowledges the critical nature of mitigating greenhouse gas emissions, which significantly

contribute to the phenomenon of global warming. The agreement promotes the development and execution of emission reduction plans by nations, along with the requirement for consistent progress reporting (UNFCCC, 2016).

I.1.3. Indonesia's Commitment of Net Zero Emission

In 2016, Indonesia formally agreed and ratified the Paris Agreement, confirming its dedication to the worldwide endeavors to address and mitigate the effects of climate change. The primary objective of the Paris Agreement is to restrict the increase in global temperatures to a level much below 2°C over the temperatures recorded before the industrial period, with additional efforts made to limit it to 1.5°C (Siraj, 2019). The Minister of the Environment and Forestry, representing Indonesian President Joko Widodo, signed the Paris Agreement on Climate Change during a High-Level Signing Ceremony for the Paris Agreement at the United Nations Headquarters in New York on April 22, 2016 (PPID, 2016). Indonesia ratified the Paris Agreement through Law Number 16 of 2016 on the Ratification of the Paris Agreement to the United Nations Framework Convention on Climate Change, enacted on October 25, 2016, as part of the government's efforts to ensure every citizen's right to a quality environment (Suwatno, 2023). To accomplish its goal of achieving net zero emissions, Indonesia intends to expedite the process of transitioning to renewable energy sources while simultaneously decreasing its reliance on coal (Simanjuntak & Hasjanah, 2023).

Indonesia has submitted its Nationally Determined Contribution (NDC) as a component of the Paris Agreement, which details its objectives for mitigating greenhouse gas emissions. Indonesia, in its revised NDC filed in 2021, pledged to decrease emissions by 29% via its own endeavors or by 41% with assistance from the international community by 2030, in comparison to a scenario where no further actions are taken (GGGI, 2021). In addition, through a Just Energy Transition partnership signed in 2022, Indonesia plans to retire coal fired power plants early, increase renewable energy capacity to one-third of total electricity capacity by 2030 (Government of Indonesia, 2022).

Indonesia has formulated a Long-Term Strategy on Low Carbon and Climate Resilience (LTS-LCCR) 2050, aligning with the objectives of the Paris Agreement.

This strategy establishes Indonesia's objective to attain net zero emissions by 2060 or earlier. The objective of the LTS-LCCR 2050 is to achieve a harmonious equilibrium between future reductions in emissions and the advancement of economic growth. To accomplish its goal of achieving net zero emissions, Indonesia intends to expedite the process of transitioning to renewable energy sources while simultaneously decreasing its reliance on coal (Simanjuntak & Hasjanah, 2023).

I.1.4. The Reality of Achieving Net Zero Emission Target

The 2023 UNFCCC Global Stocktake report reveals that countries' Nationally Determined Contributions (NDCs) are not in line with the Paris Agreement objectives, making it challenging to meet the targets of reducing global greenhouse gas emissions by 43% by 2030, 60% by 2035, and achieving net zero by 2050, with projections indicating that the earth's temperature in 2050 will surpass the Paris Agreement goals based on the NDCs submitted at COP27 (Simanjuntak & Hasjanah, 2023). A review of government data indicates that Indonesia's coal consumption rose by 33% in 2022 compared to the previous year, leading to a 20% increase in carbon emissions from fossil fuels, positioning Indonesia to potentially become the sixth largest emitter of fossil carbon dioxide globally, surpassing Japan (Jong, 2023).

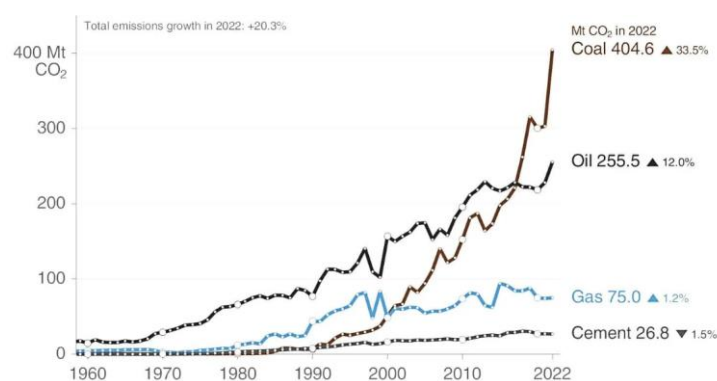


Figure I.2. Annual Fossil CO₂ Emission in Indonesia (Simanjuntak & Hasjanah, 2023).

Coal-fired power plants in Indonesia significantly contribute to the release of greenhouse gases and the pollution of the air. Although Indonesian government,

with its Presidential Regulation No. 112 of 2022, bans new coal-fired power plants in Indonesia, but still has exceptions for those in PLN's (the state-owned monopoly of Indonesia's power sector) 2021-2030 Business Plan and National Strategic Projects (Roesad, 2023). In 2021, Indonesia also ranked 9th globally in CO2 emissions from the electrical sector at 193 million tons, making it a significant contributor to global carbon emissions, and with its expanding economy and energy demand leading to increased reliance on coal-fired power plants (Jennifer, 2023). As shown in Figure 1.4 and Figure 1.5, the growth of renewable energy in Indonesia from 2010 to 2023 has been relatively insignificant, accounting for only 13% of the total national energy supply. Coal remains the predominant energy source, constituting 40% of the supply in 2023. This situation presents a stark contradiction between the country's commitment to achieve net zero emissions and the reality on the ground.

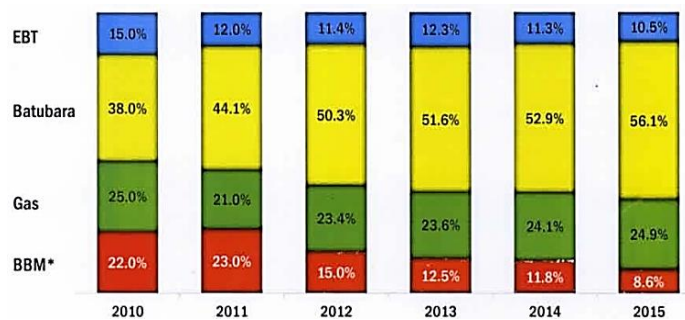
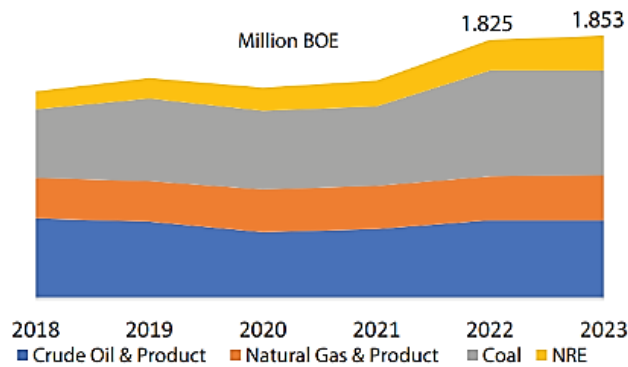


Figure I.3. Indonesia's energy supply year of 2010 to 2015 (Government of Indonesia, 2017)



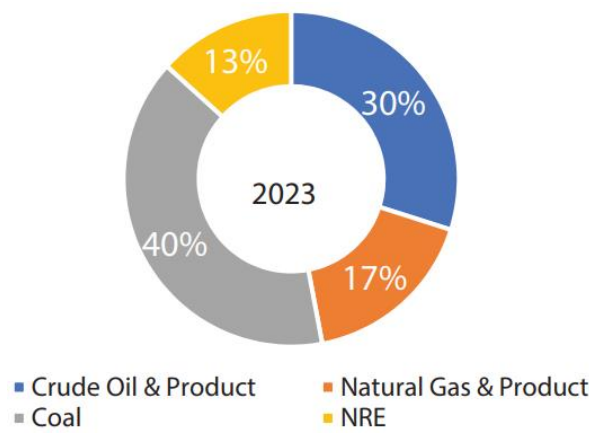


Figure I.4. Indonesia’s energy supply until 2023 (Ministry of Energy and Mineral Resources Republic of Indonesia, 2024)

The reliance on coal, despite regulatory efforts to shift towards renewable energy, underscores a significant gap in Indonesia's environmental commitment. Such a disparity raises serious questions about the country's dedication to its climate goals and suggests that without a more aggressive shift towards sustainable energy sources, Indonesia's targets for reducing greenhouse gas emissions may remain elusive. This contradiction highlights the challenges many nations face in balancing economic growth with environmental sustainability, and it puts Indonesia's global environmental commitments under scrutiny.

The Indonesian government has enacted several laws concerning carbon regulation, including the introduction of a carbon tax under Law Number 7 of 2021, initially scheduled for implementation in April 2022 (Muzakki, 2023). However, the application of this tax was postponed by finance minister Sri Mulyani in late June before the House of Representatives of the Republic of Indonesia, with a new projected date set for July 2022. The delay was attributed to domestic readiness and global energy price fluctuations exacerbated by the Russia-Ukraine conflict (Putri, 2022). Subsequently, in early quarter four of 2022, Airlangga Hartarto, the coordinating minister for economic affairs, announced a further postponement, with the carbon tax's implementation deferred to 2025 (Purwanti, 2022). This sequence of delays raises questions about the firm and comprehensive application of the carbon tax across all industries, including captive power plants, over the next five to ten years, especially considering that global uncertainties previously cited as reasons for the postponements are likely to persist.

I.1.5. Captive Power Plant in Indonesia

Captive power plants are independent power plants owned by companies, primarily in industrial estates, to meet their own electricity needs (Pradhana, 2016). According to a recent analysis by the Global Energy Monitor (GEM) and the Centre for Research on Energy and Clean Air (CREA), Indonesia has seen a surge in the use of captive coal power, with almost eight times as much capacity operating in 2023 as there was in 2013 (Hasan, 2023).

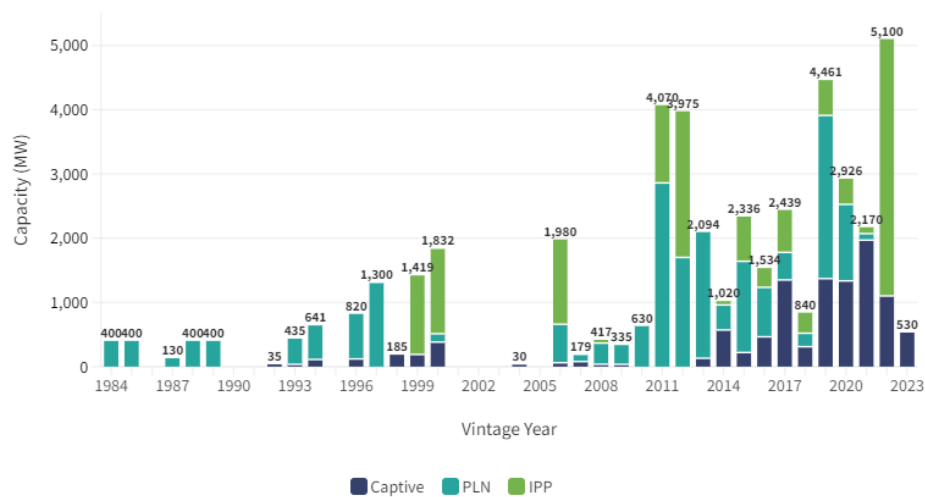


Figure I.5. Growth of operating CFPPs (Coal Fired Power Plant) by year in Indonesia.

The issues faced by captive coal plants in Indonesia are mostly related to the country's national economic strategies, insufficient electricity networks, and the absence of affordable and dependable low-carbon alternatives for captive coal power plants (M. Zhu et al., 2023). These contradictions between commitments and facts have created uncertainties for the future of captive coal power plant in Indonesia.

PT Kaltim Prima Coal (KPC) is one of the companies confronting these difficulties. KPC produces on average of more than 50 million tons of coal per year and is sold domestically and abroad. To support such massive production, KPC operates a lot of coal processing, transportation, and shipping machines. All those machines are powered by KPC's captive power plant, which use coal as its fuel source. KPC operates its own coal fired power plant to ensure continuous production without any interruptions caused by electricity supply. Nevertheless, the Indonesian

Government's commitment to attaining Net Zero Emission, as articulated in international forums, raises concerns about the future sustainability of coal power stations in Indonesia, particularly in KPC.

I.2 Company Profile

PT Kaltim Prima Coal (KPC), an Indonesian firm and subsidiary of PT Bumi Resources Tbk (BUMI), specializes in coal mining and supplying coal to clients from diverse industrial sectors, both domestic and international.

PT Kaltim Prima Coal (KPC) is a coal mining company located in Sangatta, East Kalimantan, Indonesia. KPC is a major global player in open-pit mining, holding a total of 61,543 Ha of coal mining concessions and 8,371 Ha of supporting lands for mining operations.

The mining operations of KPC are conducted by its Mining Operation Division and various mining contractors. KPC directly operates eight pits, while an additional 11 pits are run by mining contractors under KPC's supervision. KPC does not engage in partnerships with artisanal and small-scale mining (ASM) operations, nor are there any ASMs located inside or near KPC's operational areas.

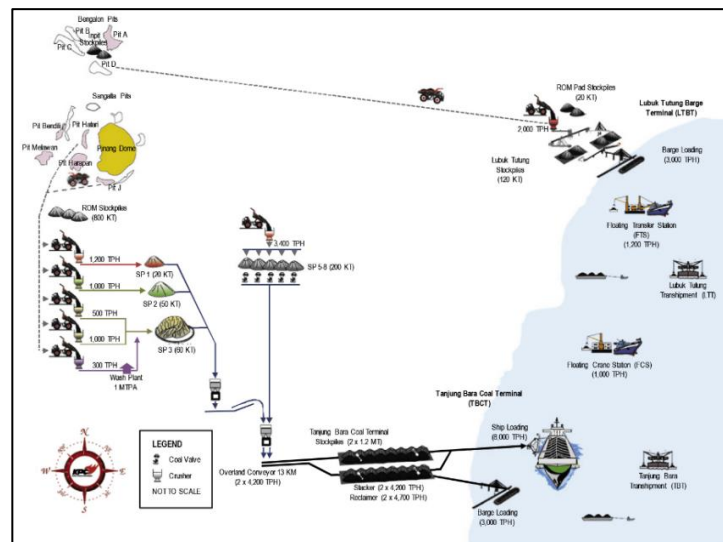


Figure I.6. KPC's coal chain.

The output capacity of KPC is 70 million tonnes per year. In 2022, KPC has estimated coal resources of 4,451 million tonnes and coal reserves of 792 million

tonnes. KPC has a workforce of 3,938 workers and an additional 25,000 personnel from contractors and allied companies.

KPC offers a range of five coal products, namely Prima, Pinang, Melawan, KPC 4500, and KPC 4200. There are five different types of these products that are classified according on their Gross Caloric Value (GCV). The greatest GCV value is found in Prima, ranging from 6400 to 6700, while the lowest GCV value is found in KPC at 4,200.

Parameters	Prima	Pinang	Melawan	KPC 4500 GAR	KPC 4200 GAR
TM (ar)	9.0 - 14.0	14.0 - 19.5	20.0 - 30.0	31.0 - 38.0	34.0 - 40.0
IM (adb)	3.0 - 7.0	9.0 - 14.5	16.0 - 24.0	18.0 - 24.0	22.0 - 28.0
Ash (adb)	4.5 - 8.5	4.0 - 8.0	4.5 - 10.0	5.0 - 10.0	3.0 - 8.0
TS (adb)	0.4 - 0.9	0.6 - 1.6	0.6 - 1.4	0.4 - 1.0	0.5 - 0.7
VM (adb)	39.0 - 43.0	38.0 - 42.0	36.0 - 40.0	34.0 - 40.0	34.0 - 40.0
GCV (ar)	6400 - 6700	5500 - 6300	4700 - 5400	4300 - 4700	4000 - 4300
HGI	45 - 50	43 - 50	42 - 50	45 - 60	50 - 70

Table I.1. Coal type product of KPC

PT KPC has a vision of becoming Indonesia's leading company in the supply of coal and its downstream products that provide optimal value for all stakeholders.

The mission of the PT KPC is to:

- a. Place the primary focus on the health and safety of employees, as well as environmental management that is committed to achieving net zero emissions.
- b. Fight for governance, human rights, and sustainable community welfare.
- c. Promote growth through sustainable learning, digital innovation, sustainable practices, and operational excellence to optimize value for all stakeholders.

Regarding environmental governance, KPC embraces and diligently implements the most effective methods of environmental management. The management system of KPC has obtained ISO 14001 certification. Mining design and strategic planning meticulously evaluate environmental factors and potential hazards as crucial factors. In addition, KPC implements a thorough and all-encompassing

environmental monitoring system to routinely assess our environmental performance and goals. KPC additionally engages in partnerships with governmental organisations and autonomous auditors to carry out environmental surveillance and reporting.

In a broad sense, KPC implements the subsequent initiatives regard to environmental governance:

- a. Preventing pollution of air, water, B3 waste, and hydrocarbons
- b. Biodiversity conservation
- c. Conservation of water and energy efficiency

In addition to its extensive coal production, KPC maintains a Captive Power plant that primarily provides electricity for coal processing, transportation, and shipping. The type of power plant is a coal-fired power plant. In March 2018, the Minister of Energy and Mineral Resources (ESDM) Ignasius Jonan inaugurated the Excess Power project of the Tanjung Bara Steam Power Plant (PLTU) (3 x 18) megawatt owned by PT Kaltim Prima Coal (KPC) in Kutai Timur Regency, East Kalimantan. The project was built in October 2011 with an investment value of USD 150 million. From the total capacity of 64 megawatts, 30 megawatts were used for electricity needs in the KPC environment (captive power), and the remaining 34 megawatts were excess power, where 18 megawatts had been contracted or sold to PLN. Nevertheless, at the end of 2021, the PLN contract was no longer extended. KPC has stopped supplying electricity to PLN.

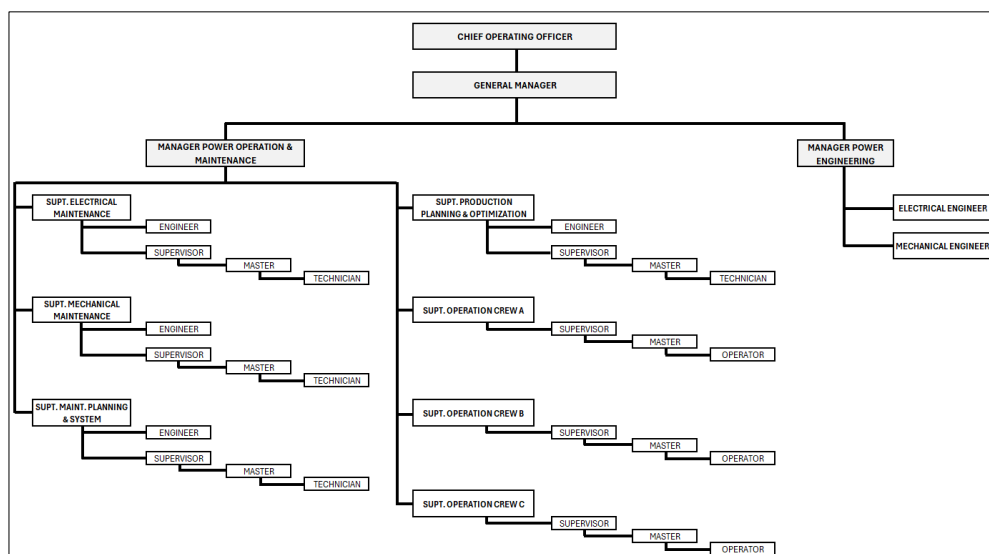


Figure I.7. Organization chart of PT KPC's captive power plant

an era of heightened environmental scrutiny, this becomes progressively more crucial for businesses.

- Captive power plants enable KPC to increase production capacity or extend operations without relying on external power providers. This feature guarantees that the organisation has the essential power infrastructure in place to facilitate this growth.
- Contingency and Emergencies. The captive power plant not only functions as the principal power source but also supplies contingency and emergency power. Operational stability and security are bolstered by this redundancy.
- Advantageous for long-term financial planning and budgeting, KPC's ability to forecast and control its energy expenses over time is facilitated by the operation of its own power plant.

I.3 Business Issue

During the period highlighted by climate change and the drive towards achieving net zero emissions, mining companies that depend on coal power plants specifically are facing uncertainty for its future. The captive power plant, which is a coal-fired power plant, has a significant role in KPC production line. It supplies electricity for coal processing, conveying, and shipping plant. Any disturbance in the power plant will directly impact to coal production and the company's revenue.

The rapid progress of technological innovation is both a challenge and an opportunity. The development of renewable energy has the potential to surpass the current capabilities of coal power, which means that significant expenditures in modernization are required to prevent becoming outdated. Securing investment and funding for coal power plants is becoming more challenging due to stakeholders' increasing reluctance to support high-emission projects, which adds extra complexity to the future of these plants. In addition, the tangible dangers presented by climate change, such as severe weather occurrences, have the potential to disrupt operations and supply chains, necessitating the implementation of strong resilience planning.

The reputational risks linked to contributing to climate change are increasing, as public awareness grows and the corporate sector encounters pressure to behave

responsibly. Adhering to international climate agreements is now a necessary requirement for businesses to retain market access and prevent incurring penalties. To remain relevant and competitive in a quickly changing global economy, mining companies must adapt by exploring energy diversification and adopting greener technologies, as the world moves towards low-carbon solutions.

In the other hand, the uncertainty over coal pricing also emerges as a crucial concern. Policy interventions, changes in supply and demand, and geopolitical situations can cause coal prices to fluctuate, resulting in market volatility. The fluctuation in energy costs and potential policy-induced price swings provide challenges for mining companies in terms of budgeting and long-term planning.

The regulatory environment is also changing, as Indonesian governments are trying to implement strict carbon emission laws and establish carbon taxes. These situations have the potential to greatly affect the financial stability and operational strategies of firms. The increasing shift towards renewable energy in the energy market introduces further uncertainty, which could reduce the need for coal and make coal-powered facilities less competitive and more financially challenging. Yet, the certainty of actually implementing the various established regulations remains a significant question. Given that carbon emission achievements have not yet met targets, and with numerous delays in regulation, it becomes a critical question whether it is time for KPC to make significant changes such as deactivating its captive power plant and heavily investing in clean energy, or whether KPC can still optimize the operation of the captive power plant to maximize coal production in the coming years.

Amid the emerging challenges of today, the captive power plant owned by KPC is grappling with uncertainty in determining the right course to navigate the future, especially considering the potential extension of KPC's mining business license in 2031. KPC is compelled to undertake decisive steps to formulate an anticipatory strategy plan that effectively addresses these future uncertainties.

I.4 Research Questions and Research Objectives

This research has three research questions:

1. What are the driving forces that lead to the uncertainty?
2. What are the plausible scenarios that might happen and its implications to KPC?
3. What are the strategy options for KPC facing the future condition beyond 2031?

The objectives of this research are:

1. Identify the critical uncertainties that influence the plausible scenarios for the future operations of KPC's captive power plant.
2. Analyse the potential implications associated with each identified scenario.
3. Formulate recommendations for each plausible scenario and establish early warning signals for proactive monitoring.

I.5 Research Scope and Limitation

The research specifically focuses on various uncertainties in the business environment and their impact on KPC's captive power plant. The research will also assess the potential risks and opportunities associated with each scenario and identify key indicators or signals that could alert PT KPC to the emergence of each scenario.

However, it is important to note that this study has certain limitations:

- This research may not provide a comprehensive representation of the wider industry or worldwide trends within the energy or mining sectors, as it solely focuses on PT KPC's captive power plant.
- Data availability about future uncertainty and its impact is limited to the information available internally at KPC and the publicly available information at the time of this research.
- The research assumes that KPC permit will be extended in 2031 and the time horizon limit of this research is for a period of 10 years after 2031.

I.6 Research Methodology

This research applies a qualitative approach, utilizing primary data gathering methods such as interviews with stakeholders, including the company's management, staff, and its contractor, as well as direct observation. The collecting of secondary data will involve conducting a comprehensive literature research, which will include examining the internal data of the company, as well as referring to published journals, books, and media sources.

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Chapter II Literature Review

This chapter provides an explanation of the theoretical foundation used in the study and describes the conceptual framework that underpins the research.

II.1 Theoretical Foundation

In this subchapter, the definitions of new terms introduced in this study will be clarified, along with the underlying theories that support the research framework. Additionally, relevant references utilized throughout the study will be discussed to provide a comprehensive understanding of the theoretical foundation.

II.1.1 Definition of Uncertainty and Its Sources

Based on Oxford Dictionary word uncertainty means the state of not knowing or of not being known exactly. In the context of organizations, uncertainty is frequently defined in three ways: as the inability to assign probabilities to the likelihood of future events; as the absence of information concerning cause-and-effect relationships; and as the incapability to precisely forecast the results of a decision. Uncertainty can also be defined as unknowability, novelty, non-optimizable, and doubt (Arend, 2024).

As an illustration of the first definition of uncertainty, consider the situation of energy businesses that are confronted with the unpredictability of future oil prices. There is still difficulty to precisely estimate the likelihood of swings in the price of oil. This uncertainty is caused by several factors, including geopolitical tensions, technical breakthroughs, and the dynamics of the market. For instance, during the period when the price of oil was falling in 2014 and 2015, energy companies had a difficult time assigning specific probabilities to the various scenarios, which influenced investment decisions and the distribution of resources (Marcus, 2019).

According to the second definition of the term, uncertainty arises from insufficient knowledge, unstable process structures, or ambiguous links between means and ends, which indicates that it is associated with cause-and-effect interactions. If the extent and probability of the implications cannot be correctly assessed, then uncertainty will continue to exist even when the direction of change is recognized. Third, uncertainty as unpredictability. In this context, decision-makers face unforeseen results due to limited knowledge or an inability to distinguish relevant and irrelevant facts. Probabilities are unclear in unexplored domains, making

decision-making an intricate process between knowns and unknowns (Arend, 2024).

Uncertainty in the business environment can have a range of causes, which can influence decision-making and strategic planning. External factor heavily affects industrial enterprise sustainability, especially in financial-economic. These factors are noticed from policy uncertainty, global crises, and stock market volatility (Shmidt & Khudyakova, 2015). During the recession period, the effect of these factors can be intensified, which will rather cause a slowing pace of growth in productivity. It will be especially serious in sectors where dependence on outside financing is high (Choi et al., 2016). Masayuki (2013) says the level of unpredictability in economic policies, which includes the environment and trade policies, tends to affect managerial decisions regarding several activities such as equipment investment, overseas operation, among others. This implies that a rational stance may, however, win in corporate investment decisions over financing conditions when the degree of uncertainty is very high (Inoue et al., 2019). Uncertainty regarding policies, specifically fiscal and monetary policies, can result in reductions in employment, investment, sales, and profits. Conversely, firms that are more exposed to external markets may experience a positive influence on exports due to trade policy uncertainty (Hlatshwayo, 2017).

II.1.2 The Uncertainty Caused by Net Zero Emission

The impact of climate change on corporate strategies, financialization, and investment decisions generates substantial uncertainty in the business environment (Ren et al., 2022). The existing uncertainty worsens by climate control regulation, which consequently necessitates the implementation of comprehensive planning methodologies (Couclelis, 2011). Companies' reactions to climate change are impacted by the relationship between business uncertainty and organizational capacities. When companies feel unsure, they are less likely to implement carbon management practices (Lee & Klassen, 2016).

In developing countries such as Indonesia, the issue of net zero emissions has generated considerable uncertainty for coal mining companies. The country's commitment to achieve net-zero coal emissions by 2060 (Natalia et al., 2022) and

the difficulties associated with a fair transition away from coal (Bößner et al., 2023) have prompted questions regarding the prospective utilization of coal. Further worsening this uncertainty are the potential transition pathways and the significance of coal in Indonesia's energy sector (Wehnert et al., 2019). The situation is further compounded by the political unpredictability surrounding global greenhouse gas mitigation policy and the consequences of expected regulatory repeals and reinstatements (Shahnazari & Mchugh, 2014). Including captive power plants managed by coal mining companies are similarly impacted by the strive to achieve net-zero emissions. The necessity for a shift towards environmentally friendly energy sources, including nuclear power and renewable energy, stems from the imperative to attain net-zero emissions (Natalia et al., 2022). Nevertheless, this transition is made difficult by political and economic obstacles in these countries, such as the coal industry's influence and the enormous expenses associated with renewable energy (Ordonez et al., 2021).

II.1.3 Importance of Managing Uncertainty

Organization could face several effects due to climate change, but the most significant are changes in the physical natural environment, policy, and the way shareholders or the market sentiment. A change in the physical natural environment is the first and most basic effect, which can have consequences for assets, infrastructure, suppliers, and markets. Even though they are physically surrounded by nature, organizations are unable to negotiate with it. In the end, everything it needs, including power, food, water, land, and air, comes from the natural environment (Haigh, 2019).

Second, the ratification of the Kyoto Protocol has been the primary driver of regulations at the federal, state, and local levels aimed at regulating, reducing, and pricing carbon emissions; these regulations could have an impact on your organization. In 2005, developed nations were obligated to reduce their carbon emissions under the Kyoto Protocol, an international treaty of the United Nations Framework Convention on Climate Change (UNFCCC). This was done on the basis that climate change is happening and that man-made industrial activity is contributing to it. Thirdly, shifts in market and shareholder sentiment are a potential

consequence of climate change for organizations. In instance, shareholders are taking action against climate change by demanding that companies disclose their exposure to climate change risks and modify their investments in fossil fuels through shareholder resolutions that are voted on by all shareholders at annual general meetings (Haigh, 2019).

The important role of managing uncertainty for sustainable practices is underscored by the fact that macro uncertainty factors, such as political instability and economic policy uncertainty, impact carbon emission reduction targets and corporate ESG (Environmental, Social, and Governance) performance (Alandejani & Al-Shaer, 2023). Businesses must prepare for the future due to the fact that uncertainty can have a significant impact on their stability and long-term success. Consider the Utah coal industry as an illustration. The region has been severely impacted by shifts in markets, technologies, regulations, and public opinion, which have led to the closure of numerous coal-fired power plants and a shift in investment focus towards natural gas facilities. Businesses should employ techniques that enable them to envision a variety of future scenarios and develop adaptable strategies to deal with potential changes in order to navigate such uncertainty. This methodology not only acquaints individuals with unforeseen changes but also empowers them to confront various circumstances that may have an influence on their field. proactive and dynamic planning is key to making sure companies stay resilient and can adapt to changing conditions (Hansen & Slaughter, 2015).

II.1.4 Introduction to Scenario Planning

Scenario planning has an important role in improving strategic thinking and decision-making within businesses. Scenario planning provides a strong alternative to traditional forecasting techniques since it generates a variety of plausible futures, whereas traditional forecasting approaches frequently fail to uncertainty and complexity (Schoemaker, 1995). Given its capacity to explicitly integrate uncertainties, scenario planning is a valuable approach for addressing future uncertainty (Lawrence et al., 2021). By integrating various information and viewpoints, scenario planning can result in more resilient decision-making (Peterson et al., 2003).

Royal Dutch Shell has been one of companies in effectively implementing scenario planning into strengthening its strategic management from as early as the early 1970s. In this case, the method incorporates the development of several credible future scenarios to project for and prepare for any fluctuations in the business environment. Initially, it was the scenario preparing from Shell only partially integrated to the routine planning processes, which caused its use to turn out more episodic and less effective. By the early 1980s, however, Shell had re-energized its interest, giving scenario planning more verve and formality among its managers (Schoemaker & van der Heijden, 1992).

In 2003, scenario planning was utilized by Peter Schwartz and Doug Randall in national scale to evaluate the possible effects of climate change on energy, food, water, and national security in the United States. Schwartz and Randall proposed an extreme climate change scenario with a sharp drop in average temperatures and persistent drought in key agricultural regions. This scenario was based on abrupt climate events like 8,200 years ago (Schwartz & Randall, 2003).

As shown in the figure below, scenario planning would be appropriate and applicable in systems characterized by high uncertainty and uncontrollable. In other cases, optimal control, hedging, or adaptive management may be appropriate responses. (Peterson et al., 2003).

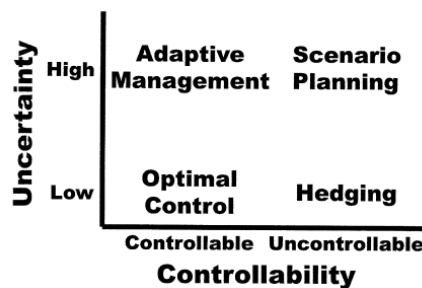


Figure II.1. Method selection based on uncertainty and controllability.

II.1.5 Comparison of Scenario Planning with Other Method

Scenario planning and forecasting are both strategic tools used by organizations to prepare for the future, but they differ significantly in approach and application. Scenario planning is an exploratory method focused on creating multiple plausible future scenarios based on various uncertainties and risks. It encourages organizations to think creatively about different potential futures and how to

navigate them, often involving qualitative analysis and collaborative processes. In contrast, forecasting relies on quantitative data and historical trends to predict a single likely future outcome. Forecasts are typically shorter-term and assume that future conditions will resemble past and present conditions, offering a more deterministic approach. While forecasting provides a more straightforward, data-driven prediction, scenario planning offers a broader perspective, allowing organizations to prepare for a range of possible outcomes and enhancing their strategic flexibility and resilience.

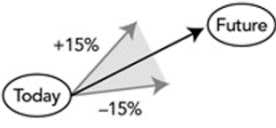
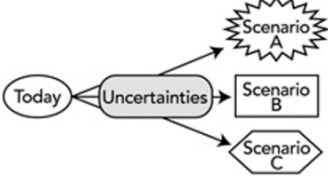
	FORECASTING	SCENARIO PLANNING
Purpose	<ul style="list-style-type: none"> • Prediction of the future based on past historical information • Planning for one future 	<ul style="list-style-type: none"> • Thinking process to consider potential futures based on risks and uncertainties • Planning for multiple futures 
Certainty	<ul style="list-style-type: none"> • Probable 	<ul style="list-style-type: none"> • Plausible
Information Type	<ul style="list-style-type: none"> • Quantitative 	<ul style="list-style-type: none"> • Qualitative and quantitative
Risks and Uncertainties	<ul style="list-style-type: none"> • Does not factor in risks and uncertainties, more about certainty 	<ul style="list-style-type: none"> • Considers risks and uncertainties
Testing	<ul style="list-style-type: none"> • Can be tested for accuracy 	<ul style="list-style-type: none"> • Difficult to test for accuracy
Theoretical Basis	<ul style="list-style-type: none"> • Based on a theoretical model • Future can be predicted 	<ul style="list-style-type: none"> • Based on relationships and causality • Future is unpredictable
Stakeholder Engagement	<ul style="list-style-type: none"> • Narrow set of stakeholders involved in the process 	<ul style="list-style-type: none"> • Wide set of stakeholders involved in the process from across the organization, internal and sometimes external
Objectivity	<ul style="list-style-type: none"> • Objective—fact based 	<ul style="list-style-type: none"> • Subjective—guessing and assumptions
Accountability	<ul style="list-style-type: none"> • Expert analysts, financial planners 	<ul style="list-style-type: none"> • CEO, top-level executives, chief strategy officer, facilitators, consultants, scenario planners, and strategic planners
Frequency	<ul style="list-style-type: none"> • Used daily 	<ul style="list-style-type: none"> • Used every 2 to 3 years
Horizon	<ul style="list-style-type: none"> • Short-term perspective 	<ul style="list-style-type: none"> • Long-term perspective
Repeatability	<ul style="list-style-type: none"> • Results can be replicated 	<ul style="list-style-type: none"> • Involves unique representations

Table II.1. Comparison between forecasting and scenario planning (Mortlock, 2021)

SWOT analysis and scenario planning are both strategic tools used in business, but they serve different purposes and operate in distinct ways. SWOT analysis focuses on identifying and evaluating the internal and external factors that can affect an organization's performance. It breaks down these factors into strengths, weaknesses, opportunities, and threats, providing a snapshot of the current situation. The primary aim of SWOT analysis is to leverage strengths, mitigate weaknesses, exploit opportunities, and defend against threats. This method is typically straightforward and relies on historical and present data to guide strategic planning.

	Differences	Similarities
Techniques	Focus: Internal and external factors (SWOT) vs. external factors (scenario planning).	Features techniques: Both methods share teamwork and outcomes.
	Purpose: Solid framework (SWOT) vs. consistent narratives (scenario planning).	Subjectivity: Subjectivity is a shared factor between the methods.
Outcomes	Unexpected opportunities: Favorable in an unstable environment (scenario planning), not for the stable environment (SWOT).	Shared understanding: An understanding of the firm (SWOT) or of the future (scenario planning).

Table II.2. Comparison between SWOT and Scenario Planning (Hofman, 2018)

In contrast, scenario planning is a more dynamic and flexible approach that prepares organizations for various potential future scenarios. This method involves creating detailed and plausible views of different future environments in which the organization might operate. Scenario planning emphasizes understanding uncertainties and anticipating changes that could impact the organization. It helps in developing strategies that are robust across multiple possible futures, thus enhancing the organization's ability to adapt and thrive under various circumstances. While SWOT analysis is more static and focused on the present, scenario planning is forward-looking and designed to manage uncertainty and complexity in strategic planning.

II.2 Conceptual Framework

Conceptual framework is an important tool that researchers use to plan their studies. It affects the questions they ask, the data they gather, and how they examine and explain their results (Terosky et al., 2023). A conceptual framework serves as the foundational structure for a qualitative research study, guiding the research process from data collection to analysis. Moreover, a well-developed conceptual framework not only aids in structuring the research but also assists in identifying gaps in current knowledge and suggesting areas for further exploration (Saldaña, 2011).

In this research, IPO (Input-Process-Output) Model is used to illustrate the conceptual framework. The IPO model helps break down complicated systems into smaller parts. By categorizing elements into inputs, processes, and outputs, the IPO model helps identify the key components that drive the system and the outcomes it produces (Deng et al., 2022).

Framework of the research begins with the uncertainty surrounding the operation of the captive power plant. This research will identify and analyse any significant factor that may have impacts for the company. Based on the critical issues considered most significant and uncertain, proceed to establish the strategic alternatives that may be implemented in response to each probable scenario in the future. The organization will come with an anticipatory plan and a framework for addressing the uncertainty in the future once a strategy for potential future scenarios has been developed.



Figure II.2. Conceptual framework of this research (Author)

Chapter III Research Methodology

This chapter will provide a detailed explanation of the methods used in this study to address all the research questions and achieve the research objectives outlined in the first chapter. The explanation will begin with an overview of the research design to ensure the analysis process is systematically explained. Following this, each step of the research design will be discussed in detail.

III.1 Research Design

Research design is a fundamental aspect of conducting high-quality research, particularly in the field of business and management. It involves the planning and structuring of a research project to ensure that the data collected is relevant, accurate, and suitable for answering the research questions. A well-thought-out research design helps in delineating the methods for data collection, the sample size, and the analytical techniques to be used (Breakwell, 2023). Research design frameworks emphasize theoretical and methodological goals while focusing authenticity, generalizability, and theory building (Turner et al., 2017).

This study begins with identifying a critical business issue. This issue sets the stage for the entire research design, guiding the data collection process and subsequent analysis. To address this problem, it gathers comprehensive data that provide insights into the causes and potential solutions. The data collection phase involves both primary and secondary sources. Primary data will be gathered through interviews and questionnaires aimed at understanding and capturing qualitative and quantitative insights.

In addition to primary data, secondary data will be crucial in providing context and background information. This includes public releases such as the company's publication documents, press releases, and news articles that shed light on recent developments and strategic decisions. Furthermore, academic books, articles, and research papers will offer theoretical frameworks and previous research findings relevant to the issue.

Once data collection is complete, the next step is to analyze the data using qualitative methods. This involves analyzing documents to extract relevant information, conducting codes and coding to identify patterns and themes, and

performing PESTEL analysis to understand the broader macro-environmental factors impacting the company.

The results from these qualitative analyses will then inform the scenario planning process. Scenario planning starts with identifying key focal issues derived from the analysis, followed by identifying and scoring driving forces that influence these issues. The two most critical driving forces are selected to create four quadrants, each representing a different scenario. For each scenario, this study analyzes its implications for the company and develop strategic options to address these implications.

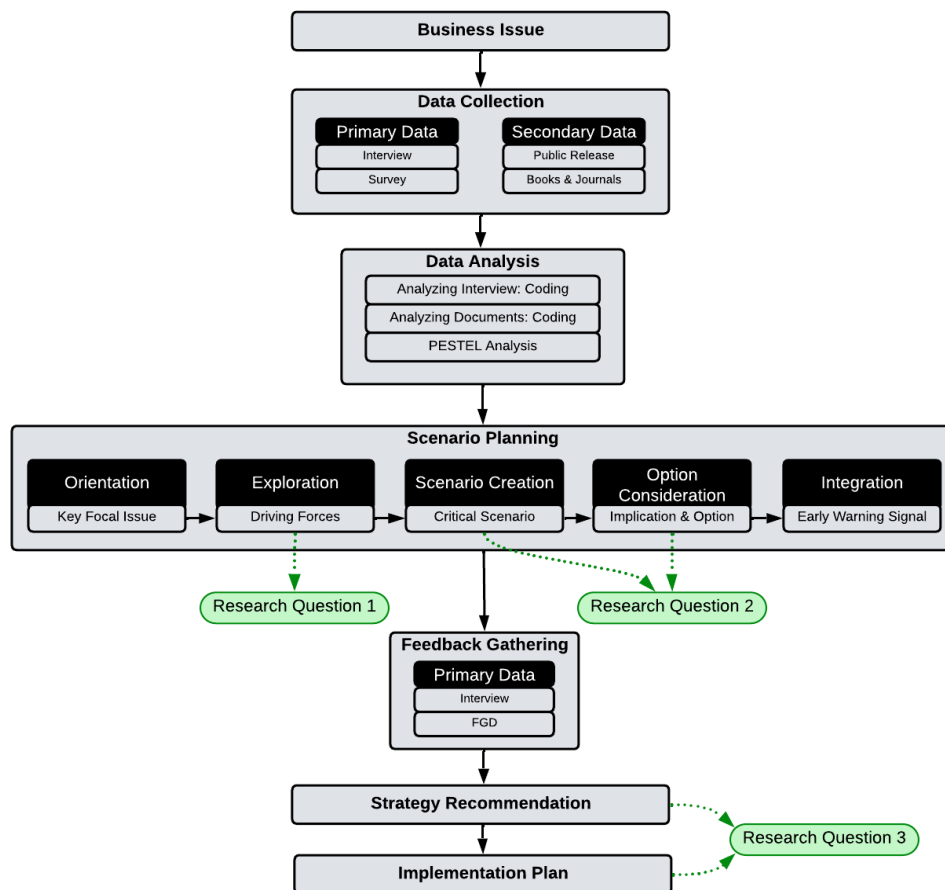


Figure III.1. Research design for this study (Author)

This study also identifies early warning signals that indicate which scenario might unfold. Through this methodical approach, the company can develop robust strategy recommendations to tackle the business issue and create an implementation

plan that is informed by comprehensive data and analysis. This ensures that the strategies are not only reactive but also proactive, positioning the company to effectively navigate future uncertainties.

At the end of this research, the results from the scenario planning method will be reconfirmed with stakeholders, particularly those within the internal power plant, to ensure that the strategic options developed are viable for implementation. Additionally, a timeline for the implementation plan will be established.

III.2 Data Collection Method

Following the identification of the business issue as discussed in Subchapter I.3, the next step involves gathering the necessary data for analysis using the scenario planning method. This data collection includes both internal data from PT KPC and external data related to captive power plants and the coal industry in Indonesia. In this research, two types of data are utilized: primary data and secondary data. A detailed discussion of these data types and their collection methods will be presented in the subsequent sections.

III.2.1 Primary Data Collection

Primary data refers to data collected directly by the researcher from first-hand sources to address a specific research question. Primary data is advantageous because it is original and unique, collected directly from sources like individuals or groups involved in the study (Kabir, 2016).

The collection methods for primary data include surveys, interviews, observations, and focus group discussion. These methods allow researchers to tailor the data collection process to the precise needs of their study, ensuring the data's specificity and applicability. Primary data is also considered more reliable and valid because it reflects real-time information directly relevant to the research problem. This process, although often time-consuming and expensive, results in data that can be used to make precise and well-informed decisions (Ajayi, 2023).

In this study, primary data was collected through survey, interviews, and Focus Group Discussions (FGD).

First is survey. A survey is a rigorously structured interaction where researchers present a predetermined set of concise questions to participants. These questions

remain consistent across all respondents. Surveys often incorporate closed-ended questions to collect data for quantitative analysis, but they may also include open-ended components for qualitative insights (Saldaña & Omasta, 2018).

Survey in this study employs online platform through Google Form. The survey consists of closed-ended and open-ended question. The closed-ended question aims to quantitatively rate the listed driving forces of the scenario planning process. Participants of the survey are asked to rate 1 to 5 for impact level and uncertainty level for each driving forces. One in the impact level means the least impactful driving forces, while in the uncertainty level means something that is convincing is either certain to happen or certainly not going to happen.

Driving Forces	Impact Level	Uncertainty Level
Geopolitical Dynamics		
Political Dynamics in Indonesia		
Coal Price Trends		
Global/International Coal Demand		
Indonesia's Coal Reserves		
Indonesia's GDP Growth		
Green Financing Challenges		
Local/Indonesian Coal Demand		
Qualified Workforce		
Electricity Demand Trend		
Community and Customer Aspirations		
Distribution and Access to Energy for Communities		
Advancement in Energy Storage Technology		
Carbon Capture, Utilization, and Storage Technology		
Coal Down streaming Technology		
Climate Change Trends		
Pollution Trends in Indonesia		

Renewable Energy Usage Trends in Indonesia		
Carbon Tax & Carbon Credit Regulations		
Coal Sales Royalty Regulations		
Regulations on the Ban of Coal-Fired Power Plants		

Table III.1. List of driving forces

Below is the list of open-ended question in the survey.

- a. *“Menurut Anda apa saja tantangan yang akan dihadapi oleh PLTU Batu Bara PT. KPC di masa mendatang setelah tahun 2031?”*
- b. *“Menurut Anda apa dampak bagi PLTU Batu Bara PT. KPC sehubungan dengan isu lingkungan global terkait Net Zero Emission atau Zero Carbon?”*
- c. *“Menurut Anda, strategi apa yang perlu dilakukan atau disiapkan oleh PLTU PT KPC untuk menghadapi tantangan Net Zero Emission jika tahun 2031 izin usaha KPC diperpanjang?”*
- d. *“Menurut Anda, tanda-tanda apa saja yang perlu diperhatikan PT KPC dalam 10 tahun kedepan untuk menentukan apakah strategi di atas perlu dijalankan atau tidak?”*

The second method is interview. Interview is a crucial qualitative research method, offering profound insights into participants' views, experiences, and motivations. They come in three primary forms: structured, semi-structured, and unstructured. Structured interviews are akin to spoken questionnaires with fixed, predetermined questions, ensuring consistency and clarity but limiting the depth of responses. Conversely, unstructured interviews are highly flexible, without any set questions, allowing conversations to develop naturally based on participant responses, thereby uncovering rich, detailed data; however, they can be difficult to manage due to their lack of organization. Semi-structured interviews provide a middle ground, featuring key questions to steer the discussion while permitting deeper exploration of emerging topics (Gill et al., 2008).

This study employs semi-structured interviews while still utilizing the same questions as those in the survey. The semi-structured format was chosen to allow flexibility for researchers, ensuring that participants address all the main questions previously formulated by the researcher. Occasionally, participants may provide explanations beyond the initial questions, necessitating additional inquiries to refocus the discussion on the intended topics.

The third method is Focus Group Discussion (FGD). FGD involve guided discussions with a small group of participants to explore their views and opinions on a specific topic. This method provides rich qualitative data through the dynamics of group interaction. In focus groups, which vary in size from 2 to 12 participants, the dynamic of group interaction often aids in memory recall, where stories or details shared by one participant can trigger memories or prompt reconsideration of responses among others, leading to a collective enhancement of recollections and corrections of inaccuracies (Saldaña & Omasta, 2018).

III.2.2 Secondary Data Collection

Secondary data refers to data that has already been collected by other researchers, organizations, or institutions for purposes other than the specific research question at hand. This type of data is obtained from sources such as government publications, books, journal articles, and internal company records (Kabir, 2016). Secondary data analysis is more time and cost-efficient as it utilizes existing datasets, often freely or inexpensively available, reducing the need for extensive research personnel involvement and eliminating the necessity for participant incentives, with data sources ranging from public government to private data (Dunn et al., 2015). Here are some types of Secondary Data which is utilized in this study:

Firstly, government publications, these are official reports, statistics, and data released by government agencies, offering reliable and comprehensive information on various subjects, such as economic performance, demographic trends, and public health statistics.

Secondly, academic and professional books which provide detailed insights, theories, and data on specific topics, useful for background research and understanding broader contexts.

Thirdly, peer-reviewed journal articles that present in-depth research findings and reviews on particular subjects, essential for grasping current developments and past research in a field.

Next is websites or online sources, including organizational websites and databases, offer accessible information on numerous topics, though researchers must carefully assess the credibility of these sources.

The last is the data which are coming from private organization or internal company data. These include data collected by organizations during their regular operations, such as sales reports, financial statements, and customer databases, providing practical insights specific to the organization's context.

III.2.3 Participant Selection

Selecting participants for interviews in qualitative research necessitates careful consideration regarding the type and number of participants to be involved, based on the predetermined research design. The research question and the type of study being conducted significantly influence the selection of participants (Saldaña & Omasta, 2018).

In determining the number of participants, Creswell (2023) explains that the required number of participants in qualitative research is not fixed. The key criterion is reaching saturation, which occurs when additional data no longer provide new insights or information. Marshall et al. (2013)'s research on effective participant numbers in qualitative studies also suggests that by considering the saturation graph against the number of participants and case studies conducted, it is found that 15 to 30 participants are effective for qualitative research in a single case study. In her book on scenario planning for climate change, Haigh (2019) provides explicit guidance on who should be included in data collection during the scenario planning process as shown in the table.

Board members	Industry or business associations, or chambers of commerce
Customers	Policymakers and regulators
Suppliers	Local utilities and infrastructure providers (energy, water, transportation, communications)
Employees	Co-located organizations
Unions	Long-term lessors
Shareholders and other types of investors	Town planners
Social media followers	Civil defense organizations and managers of local emergency responses
Financiers and creditors	Users
Insurers	News media
Benefactors and patrons	Community members and organizers
Beneficiaries	Community and neighborhood associations

Table III.2. Suggested stakeholders for scenario planning (Haigh, 2019)

This indicates that the required number of participants in qualitative research can be quite variable. Additionally, Saldaña & Omasta (2018) introduce the concept of purposive sampling, where respondents are selected based on their ability to provide the most relevant and in-depth information about the phenomenon being studied. This study selects the participants as follows.

No.	Position	Name	Working Experience	Purpose
1	KPC BOD (Board of Director) member	DS	> 10 years	Strategic decision-making at the company level, providing a holistic view of PT KPC's long-term goals and strategies to address net zero emission challenges.
2	KPC BOD (Board of Director) member	IH	> 10 years	Strategic decision-making at the company level, providing a holistic view of PT KPC's long-term goals and strategies to address net zero emission challenges.
3	KPC CEO (Chief Executive Officer)	AM	> 10 years	Responsible for the implementation of the company's strategies and policies, including those related to addressing net zero emission challenges.

4	Manager O&M Power Plant	AK	> 10 years	Overseeing operations and maintenance at the power plant, offering insights into operational challenges and opportunities for efficiency improvements.
5	Manager Engineering Power Plant	SR	> 10 years	Technical and managerial knowledge related to engineering at the power plant, crucial for planning and implementing new technologies for energy efficiency and emission reduction.
6	Electrical Engineering Advisor Power Plant	SP	> 10 years	Providing technical advice on electrical systems at the power plant, important for understanding technical requirements and solutions for achieving net zero emissions.
7	Supt Maintenance Power Plant	RW	> 10 years	Responsible for power plant maintenance, offering insights into equipment conditions and the need for repairs or upgrades to enhance efficiency and reduce emissions.
8	Supt Coal Production Maintenance	AT	> 10 years	Managing coal production maintenance, important for understanding the integration between coal production and power plant operations and their impact on net zero emission strategies.
9	Supt Coal Production Maintenance	MZ	> 10 years	Managing coal production maintenance, important for understanding the integration between coal production and power plant operations and their impact on net zero emission strategies.
10	Supt Operation Power Plant	RH	> 10 years	Responsible for daily operations at the power plant, providing practical insights into challenges and opportunities for improving efficiency and reducing emissions in day-to-day operations.
11	Supt Planning & Production Optimization Power Plant	MF	> 10 years	Managing planning and production optimization at the power plant, crucial for long-term planning and operational optimization to achieve net zero emission targets.
12	Engineer Operation Power Plant	ZF	5-10 years	Offering technical insights into power plant operations, important for understanding technical and

				operational aspects of achieving efficiency and emission reductions.
13	Senior Engineer Operation Power Plant	HW	> 10 years	Offering technical insights into power plant operations, important for understanding technical and operational aspects of achieving efficiency and emission reductions.
14	Supervisor Operation Power Plant	AD	5-10 years	Supervising daily operations at the power plant, providing practical insights into challenges and opportunities for improving efficiency and reducing emissions in day-to-day operations.
15	Manager Environment	KN	> 10 years	Responsible for environmental management at the company, offering insights into policies and practices that can be implemented to achieve net zero emissions.
16	Supt HSES 1	KB	> 10 years	Overseeing health, safety, and environmental aspects at the power plant, crucial for understanding safety and environmental considerations in net zero emission strategies.
17	Supt HSES 2	RM	> 10 years	Overseeing health, safety, and environmental aspects at the power plant, crucial for understanding safety and environmental considerations in net zero emission strategies.
18	Manager Business Analyst	SS	> 10 years	Analyzing business and market data, important for understanding the financial and market impacts of net zero emission strategies.
19	Manager Energy	MG	> 10 years	Managing energy at the company, providing insights into energy efficiency strategies and the use of renewable energy in achieving net zero emissions.
20	Manager Human Resource	IZ	> 10 years	Responsible for human resource management, important for developing competencies and training employees in the implementation of new technologies and net zero emission strategies.

21	Supt Finance 1	AA	> 10 years	Managing the financial aspects of the company, crucial for understanding investment needs and financing strategies to achieve net zero emissions.
22	Supt Finance 2	ZR	> 10 years	Managing the financial aspects of the company, crucial for understanding investment needs and financing strategies to achieve net zero emissions.
23	Supt Marketing	YP	> 10 years	Responsible for product marketing, important for understanding how net zero emission strategies can impact the company's image and market demand.
24	Engineer External Relation	MR	> 10 years	Managing the company's external relations, important for communication and collaboration strategies with external stakeholders in implementing net zero emissions.
25	Other company BOD member	GM	> 10 years	Providing external perspectives on best practices and strategies employed by other companies in addressing net zero emission challenges and potential inter-company collaborations.

Table III.3. List of respondents for this study (Author)

III.3 Data Analysis Method

III.3.1 Qualitative Analysis

a. Analyzing Interview

Coding in interview analysis is an essential technique for transforming complex qualitative data into understandable and useful insights. This method begins with the transcription of interviews, followed by a methodical reduction of the text through the identification and categorization of key phrases or concepts, often referred to as codes by Saldaña & Omasta (2018). This initial coding process is pivotal for deeper analytical work, assisting researchers in pinpointing both recurring themes and distinct insights present within the data.

This coding process aids researchers in identifying emerging themes, motifs, or patterns from the gathered data. Creswell (2023) advocates for a systematic approach to coding, suggesting that researchers should initially create categories based on the research objectives and questions, and then iteratively refine these categories as more data is analyzed. This structured approach ensures a thorough and focused analysis, leading to more substantive and actionable findings.

In this research, the coding process is utilized at several stages within the scenario planning analysis method. Initially, coding is employed to gather information about the list of driving forces required for the preliminary analysis of scenario planning. It is used to acquire data related to factors influencing uncertainties for KPC's captive power plant as it faces the challenges of achieving net zero emissions in the future.

For example, from the recorded interview of CEO of KPC, it was found some codes that could be extracted as the driving forces as follows.

Participant's Statement	Codes
<i>"(14:52) um you know when the push in the light of the global push towards having green"</i>	Global Push Towards Green Energy
<i>"(15:39) that's the key word today so we are besides bonfire power plant we have started looking at solar and biomass"</i>	Transition from Coal
<i>"(16:07) you go to the banks insurance companies if you are only a whole company"</i>	Banking and Financing Challenges
<i>"(18:31) you have to adapt yourself to the genius also as fast as the world is changing if you look at AI today is the buzzword from the techies"</i>	Technological Advancements
<i>"(19:03) technologies like AI digitalization your entire operations in future"</i>	Embracing Digitalization
<i>"(19:29) then we have to read a lot I have started at my age learning about green hydrogen learning green hydrogen"</i>	Continuous Learning
<i>"(19:46) just concentrate on something new in this today's world"</i>	Adapting to New Energy Sources

Table III.4. Part of coding process from the interview of CEO (Author)

Furthermore, this coding process is also employed to extract information on the potential impacts on KPC's captive power plant due to the global challenge of net

zero emissions. These impacts are summarized as implications of each scenario that arises from two critical uncertainties.

In the stage of developing recommendation options for each scenario, coding is again utilized to compile a list of recommendations suggested by participants. These recommendations are intended to inform strategies for the captive power plant to navigate the post-2031.

b. Analysing Document

According to Saldaña & Omasta (2018), the document analysis process involves the collection, annotation, and reflective engagement with materials. This method allows researchers to identify patterns and insights that may not be readily visible. It is recommended that documents be examined not only for their manifest content, which includes the explicit and visible details, but also for their latent content, which encompasses deeper meanings and implications hidden within the text.

Creswell (2023) describes document analysis as a meticulous examination of relevant documents to gather data about a phenomenon without direct interaction with research subjects. This includes both public and private documents such as newspapers, reports, meeting minutes, archives, personal journals, emails, and other online documents. Document analysis is utilized by researchers to gain a deeper understanding of the context or to corroborate information obtained through other methods such as interviews or observations. Creswell (2023) highlights the importance of selecting authentic documents that are pertinent to the research questions and advocates for a systematic approach to coding and analyzing these documents to ensure thorough and reliable findings.

In this study, document analysis was conducted to obtain and refine information previously gathered from primary data. For instance, in identifying driving forces, a review of official documents published by the government was undertaken to determine if there are any governmental policies that might introduce uncertainties and impact the future of KPC's captive power plant. Here are examples of some government publications in the form of regulations or laws that directly affect KPC's captive power plant.

Documents Name	Findings
Law (UU) Number 16 of 2016	The Indonesian government has confirmed its commitment to participate in global efforts to achieve net zero emissions.
Presidential Regulation (Perpres) Number 22 of 2017	The Indonesian government has set targets for reducing the use of coal energy and increasing the utilization of renewable energy sources.
Law (UU) Number 7 of 2021	The Indonesian government has announced the implementation of a carbon tax on industries that produce carbon emissions within the country.
Presidential Regulation (Perpres) Number 112 of 2022.	The Indonesian government has imposed a ban on the construction of new coal-fired power plants (PLTU) and is accelerating the closure of currently operating PLTUs. This move is part of the country's broader strategy to meet its climate goals and transition towards sustainable energy sources.

Table III.5. Findings during document analysis process (Author)

c. PESTEL Analysis

PESTEL analysis is a method used to examine external factors that can impact the effectiveness of an organization or project (González Ortega et al., 2019). Six elements comprise the framework which are political, economic, social, technological, environmental, and legal. Organizations use these elements to understand the broader environment in which they operate and prepare for potential changes. For instance, government policies, regulations, and trade agreements, which significantly influence business operations and profitability, are included in political factors (Ellis, 2020). Aspects such as economic growth, inflation rates, and

currency exchange rates that affect an organization's financial performance are involved in economic factors (Song et al., 2017).

The framework includes social factors, which refer to the cultural, demographic, and lifestyle trends impacting consumer behavior and market demand. These factors are understood by businesses to help tailor their products and marketing strategies to better meet the needs of their target audience (Ellis, 2020). The impact of technological advancements and innovations on industry dynamics is examined by technological factors. This includes the adoption of new technologies, research and development activities, and the pace of technological change (Thakur, 2021). Companies keep abreast of technological trends to provide themselves with a competitive edge and enable operational efficiency improvements.

The environmental aspects such as climate change, sustainability practices, and environmental regulations influencing business operations are considered by environmental factors. These factors are addressed by organizations to mitigate risks and enhance their sustainability profiles (Song et al., 2017). Laws and regulations, including labor laws, consumer protection laws, and industry-specific regulations impacting business operations, are encompassed by legal factors. Legal requirements must be complied with by companies to avoid penalties and maintain a good reputation (Thakur, 2021). Businesses develop strategies by analyzing these PESTEL factors to navigate external challenges in their environment.

In this research, the PESTEL framework is utilized to identify the driving forces during the scenario planning method stages. This approach helps to pinpoint the factors contributing to uncertainty and their impacts on the operations of KPC's captive power plant in the future. The PESTEL analysis allows for a comprehensive examination of political, economic, social, technological, environmental, legal, and intercultural factors that could influence the strategic decision-making for managing the power plant's future challenges.

III.4 Scenario Planning Method

Scenario planning has several steps in its process. Based on the book of Peter Schartz the Art of the Long View, he describes these in eight steps which are identify focal issue or decision, key forces in the local environment, driving forces,

rank by importance and uncertainty, selecting scenario logics, fleshing out the scenarios, implications, and selection of leading indicators and signposts (Schwartz, 1996).

Garvin and Levesque elaborate scenario planning into eight components and five stages. The eight key components, each contributing to a comprehensive analysis of potential futures to guide strategic decision-making.

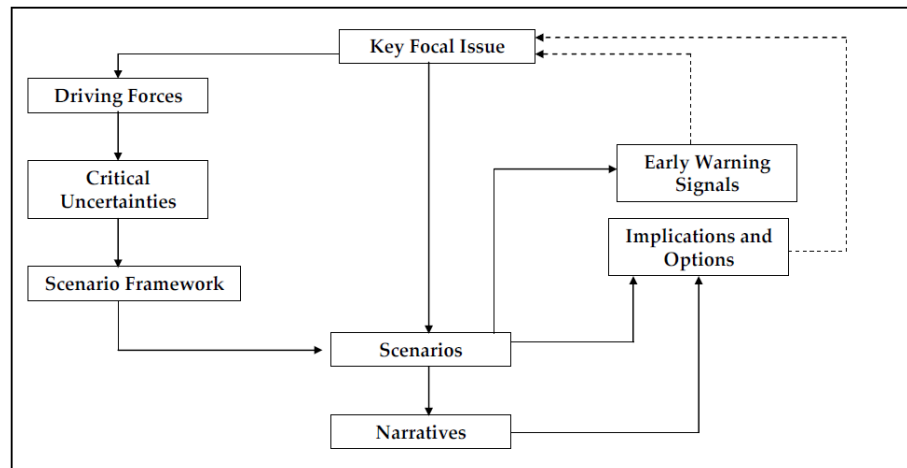


Figure III.2. Scenario planning components (Garvin & Levesque, 2006)

a. Key Focal Issue.

In the initial stage, known as orientation, the key focal issue is identified from the challenges faced by the company. This issue is extracted from various information sources gathered during data collection, including both primary and secondary data. Primary data was collected from respondents through surveys and interviews that posed questions about the challenges faced by KPC's captive power plant in meeting net zero emissions targets, particularly beyond the year 2031. Secondary data, as previously discussed in Chapter 1 within the background and business issue section, is observed and analyzed to build understanding of the practical challenges to be encountered.

This is the central question or decision that the scenario planning exercise aims to address. It should have significant long-term implications for the organization.

b. Driving Forces.

These are the major external factors that could influence the focal issue. They include social, economic, political, and technological trends. For a retail company,

driving forces might include changes in consumer behavior, economic conditions in target markets, political stability, and advancements in e-commerce technology.

c. Critical Uncertainties.

Among the driving forces, some are more uncertain and impactful than others. These are identified as critical uncertainties. For the retail expansion scenario, critical uncertainties could include the stability of political environments in emerging markets and the rate of economic growth in those regions.

d. Scenario Framework.

This involves creating a framework by combining the most significant critical uncertainties into a matrix, often a 2x2 grid, to explore different future scenarios. For example, one axis might represent political stability (ranging from stable to unstable), and the other might represent economic growth (ranging from low to high).

e. Scenarios.

These are detailed narratives describing possible future environments based on the scenario framework. They help in visualizing how different combinations of uncertainties might unfold. For instance, one scenario might describe a future with high economic growth and political stability, leading to a booming retail market.

f. Narratives.

Each scenario is fleshed out into a coherent story that explains how the world might move from the present to the future state described in the scenario. This storytelling makes the scenarios vivid and easier to understand. For example, a narrative might describe how stable political policies and economic reforms attract foreign investments, boosting the retail sector.

g. Implications and Options.

Once scenarios are developed, their implications for the organization are analyzed. This step involves identifying potential strategies, actions, and decisions that could be taken in response to each scenario. For example, if one scenario indicates a future where economic growth is high but political instability is a risk, the company might explore options for flexible supply chain management and contingency plans for political disruptions.

h. Early Warning Signals.

These are indicators that suggest which scenario might be emerging. They help in monitoring the environment and making adjustments to strategies as needed. For example, an early warning signal for political instability could be changes in government policies or signs of civil unrest.

After identifying the eight components of this method, scenario planning involves five key stages.

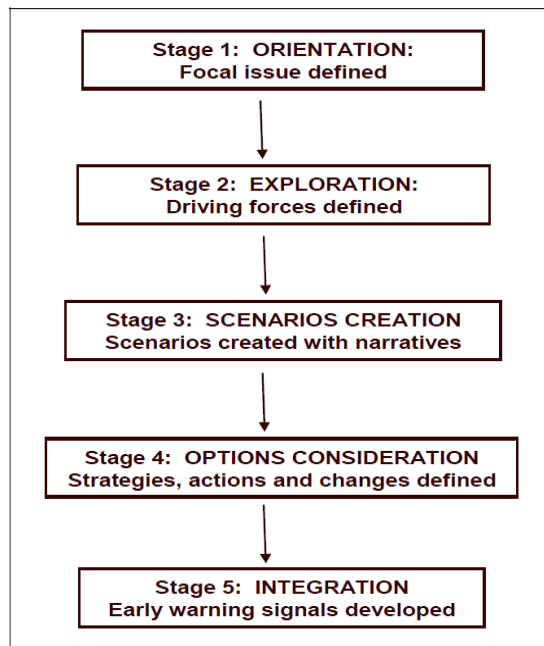


Figure III.3. Scenario planning method (Garvin & Levesque, 2006).

1. Orientation Stage.

This stage involves understanding the key focal issue or decision that the scenario planning exercise will address. It includes background research and interviews to define the scope and timeframe of the issue.

2. Exploration Stage.

In this stage, the team identifies and analyzes the driving forces and critical uncertainties that could impact the focal issue. This involves extensive research and workshop sessions.

To identify driving forces, the perspective should be external to the organization, rather than internal. Technological innovation within an organization, for example,

is not considered a driving force. Instead, it typically serves as a response to societal demand for technologically advanced goods or services and competition in that market. Even if an organization is extensive and holds significant political power, influencing global technological innovation broadly, it remains unable to control external factors such as climate change (Haigh, 2019). Focusing on long-term development in a complex and rapidly changing environment renders the inside-out perspective inadequate because it hinders the ability to foresee marketplace changes that are not yet apparent, making it crucial to begin by examining the driving forces that could impact the business arena of the organization (Lindgren & Bandhold, 2003).

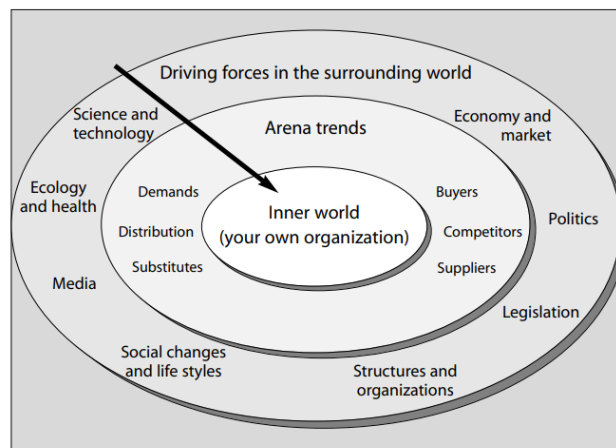


Figure 3.2. The outside-in perspective of scenario planning

Figure III.4. The outside-in perspective of scenario planning (Lindgren & Bandhold, 2003)

An example of identifying driving forces based on external factors can be seen in Deloitte's report on their scenario planning, which focuses on the global energy issues projected for the year 2035. Deloitte identified 19 driving forces, categorized into social, technological, economic, environmental, and political groups.

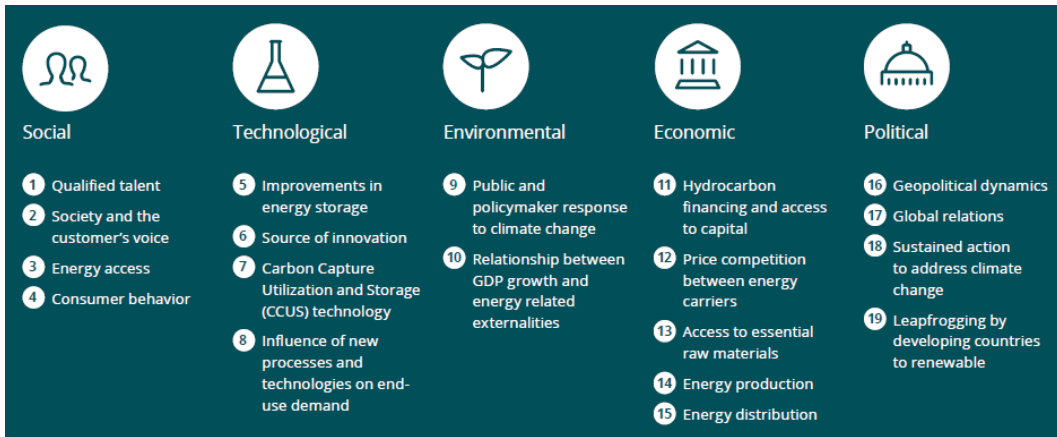


Figure III.5. External driving forces in Deloitte's scenario planning (Tuff & Helmi, 2020)

After having the list of driving forces, the next step in exploration stage is finding the critical uncertainties. Score one to five is utilized to rate the driving forces in order to find the most critical uncertainties. The most critical uncertainties are taken from combination of the most impactful and the most uncertain driving forces. If the impact level 5 means the driving forces is very impactful to the company while level 1 is the least. For the uncertainty level, 5 means the driving force is the most unpredicted or uncertain, while 1 means it can be easily be predicted.

3. Scenario Creation Stage.

This stage involves creating a framework for the scenarios by combining the most significant or critical uncertainties into a matrix with two axis or matrix 2x2 (Schwartz, 1996). The study then develops detailed narratives for each scenario.

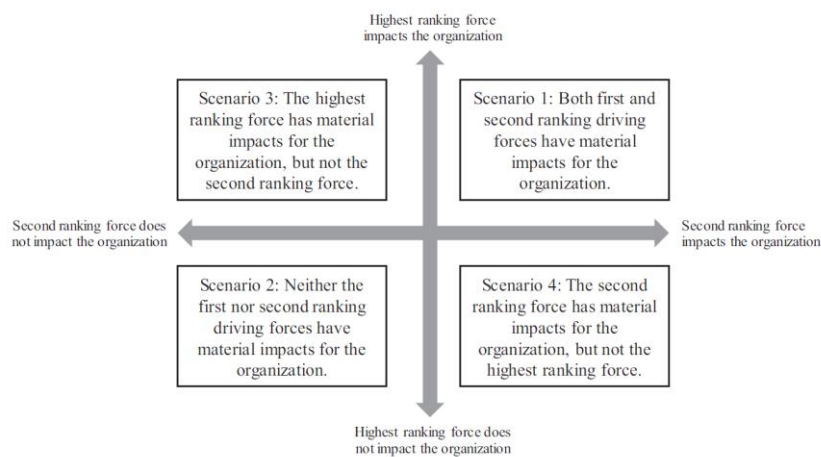


Figure III.6. 2x2 Matrix scenario framework (Haigh, 2019)

4. Options Consideration Stage.

In this stage, the study analyzes the implications of each scenario for the organization and identifies strategic options and actions. This involves brainstorming potential responses and evaluating their robustness across different scenarios.

5. Integration Stage.

The final stage involves integrating the scenarios and strategic options into the organization's current management processes. This includes developing early warning signals to monitor which scenario might be emerging and using the scenarios to guide ongoing strategic decisions.

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Chapter V Results and Discussion

In this chapter, the stages of the scenario planning analysis process will be discussed, utilizing methods outlined in the previous chapter. This analysis follows a sequential order as depicted in the research design diagram. The chapter will conclude with the formulation of a business solution, which is derived from the scenario planning process addressing issues faced by KPC's captive power plant. Finally, at the end of this chapter, the implementation plan will be detailed, aiming to realize the strategic recommendations obtained from the scenario planning process.

V.1 Analysis

The scenario planning analysis process unfolds in five stages. It starts with "orientation," pinpointing the central issue to be addressed. Next is "exploration," where driving forces and critical uncertainties are identified to outline possible future impacts. The third stage, "scenario creation," involves crafting potential future scenarios. This leads to the "consideration" phase, where the implications and strategic responses for each scenario are developed. The final stage, "integration," focuses on identifying early warning signals for each scenario, enabling the company to monitor changes and prepare responses proactively.

V.1.1 Orientation Stage

The key focal issue guides the entire scenario planning process through the central question. As summarized from the discussion in Chapter 1, KPC faces the challenge of aligning with Indonesia's Net Zero Emission Roadmap, which aims to eliminate coal-fired power by 2030 and achieve an 80% renewable energy mix by 2060 (Larasati & Mafira, 2023), while KPC remains reliant on its coal-fired plant.

The critical question addressed is, "How will KPC's captive power plant maintain operational sustainability and align strategically with Indonesia's NZE goals post-2031?"

V.1.2 Exploration Stage

In the exploration stage, this study identified the driving forces and analyzed to find the critical uncertainties that could impact the focal issue from the previous stage. Identification of driving forces began with collecting data from interview record of KPC management and other published document such as journals and report from

the previous study in energy sector. The collected data is then codified and categorized using PESTEL Analysis.

From the analysis, 21 driving forces were identified as shown in the table.

PESTEL Category	Driving Forces (Code)	Source	Quote
Political	Geopolitical Dynamics	(IRENA, 2023), GM	<i>"It is intended as a resource for policy makers, industry leaders, researchers and civil society actors who seek to understand and address the geopolitical challenges of a renewables-based energy transition"</i> <i>"The government is pressured to use renewable energy."</i>
	Political Dynamics in Indonesia	(Sekaringti et al., 2023)	<i>"For a long time, this missing legal precondition tacitly indicated an unstable political state of Indonesia's renewable energy development."</i> <i>"Political pressure from incumbents that may oppose the transition."</i> <i>"To dig further into the domestic political economy of Indonesia's energy transition, it is important to see how the energy systems come to what it is like today."</i>
Economic	Coal Price Trends	GM, DS, IH	<i>"Coal is still the cheapest energy source, costing 3-4 cents per KWH, while others are above 5 cents, especially geothermal which is 12 cents per KWH."</i> <i>"The normalization of coal prices much probably will continue even further."</i> <i>"For us, coal producers, it's not a problem to find a market for 5 million tons for export because the export prices compared to the special prices for PLN are still better."</i>
	Global/ International Coal Demand	GM, DS, IH	<i>"The demand for coal might still remain high because renewable energy targets are not being met."</i> <i>"The markets are a little wavy; India and China are a bit unsteady. Japan has cut its requirement by 10% this year."</i> <i>"For us, coal producers, it's not a problem to find a market for</i>

		<i>5 million tons for export because the export prices compared to the special prices for PLN are still better."</i>
Indonesia's Coal Reserves	GM, DS, AM	<i>"Coal will still be a primary energy source for the next 10-20 years because there are no other options." "We will maintain KPC and our main assets as a cash cow." "KPC is one of Indonesia's largest producer and exporter of coal based in Sangata, East Kalimantan in Indonesia, it's the world's largest open pit mining sites with a production capacity of over 70 million tons per year."</i>
Indonesia's GDP Growth	(Sekaringtias et al., 2023)	<i>To dig further into the domestic political economy of Indonesia's energy transition, it is important to see how the energy systems come to what it is like today. Bappenas generates its own Low Carbon Development report that argues for a 6 % GDP growth per year until 2045 with a low-carbon economy.</i>
Green Financing Challenges	AM, IH	<i>"But people today if you go to a bank, you ask for funds, 'Hey you are a coal company, we don't want to give.' If you go to a rating agency, you are already down by 50 percent." "If the government gets funds from abroad to replace old coal-fired power plants so they can be shut down, they also need to consider the investment and costs."</i>
Local/Indonesian Coal Demand	GM, IH	<i>"Coal plants are gradually being shut down and no new ones will be built after 2030." "Total domestic coal usage is around 200 million to 210 million." "The government is now starting to consider accelerating the retirement of coal-fired power plants, especially those powered by coal in Indonesia."</i>

Social	Qualified Workforce	DS, AM,	<i>"Ensuring our operations and subsidiaries work to maximum efficiency with highest attention paid to cost management and control." "We have to ensure that our coal operations and subsidiaries are working to maximum efficiency with the highest attention paid to cost management and control."</i>
	Electricity Demand Trend	DS, IH	<i>"As quarter three ends and winter looms large in quarter four, there should be a pickup in demand as usual." "Investment and whether reducing coal-fired power plants will lead to a decrease in electricity capacity."</i>
	Community and Customer Aspirations	GM	<i>"In our mines, we engage with local communities to encourage tree planting to absorb CO2."</i>
	Distribution and Access to Energy for Communities	IH	<i>"Investment and whether reducing coal-fired power plants will lead to a decrease in electricity capacity."</i>
Technological	Advancement in Energy Storage Technology	(Zahari & McLellan, 2023)	<i>"One of the increasingly common and convenient forms of energy storage is in batteries; however, the production of battery materials poses a negative climate impact with more than 10 kg CO₂eq per kWh battery capacity."</i>
	Carbon Capture, Utilization, and Storage Technology	(IEA, 2020)	<i>Policy makers can accelerate the low-carbon transition by supporting policies that promote carbon capture technologies in power generation</i>
	Coal Downstreaming Technology	DS, AM, IH	<i>"We'd be looking at converting coal into ammonia." "We are getting into downstream projects. KPC will invest in coal gasification, we will produce ammonia out of it." "According to us, coal industry players, especially those companies that have anticipated this by starting to diversify their business beyond just coal mining."</i>

Environmental	Climate Change Trends	(Met Office, 2023)	<i>"The primary factor causing climate change is the combustion of fossil fuels, namely oil, gas, and coal, resulting in the substantial emission of carbon dioxide (CO2) into the atmosphere"</i>
	Pollution Trends in Indonesia	IH	<i>"Coal-fired power plants are accused of being one of the causes of air pollution in the capital."</i>
	Renewable Energy Usage Trends in Indonesia	DS, IH	<i>"The government's target for 2025 is to use 23% renewable energy, but as of last year, we were only at around 12%." "The government is now starting to consider accelerating the retirement of coal-fired power plants, especially those powered by coal in Indonesia."</i>
Legal	Carbon Regulations	GM	<i>"We have started to implement carbon trading and sustainability measures in our operations."</i>
	Coal Sales Royalty Regulations	DS	<i>"You mentioned a lot about the high royalties that is also considered to be a burden to the company."</i>
	Regulations on the Ban of Coal-Fired Power Plants	GM, DS, AM, IH	<i>"Coal plants are gradually being shut down and no new ones will be built after 2030." "Managing margins in an optimal manner, keeping our markets fed with exactly what they want." "The government regulations which has come and how we will get over it, how we move ahead, how to reduce costs has become a major challenge for all of us in the mining industry basically." "The government is now starting to consider accelerating the retirement of coal-fired power plants, especially those powered by coal in Indonesia."</i>

Table IV.1. Result of coding and PESTEL analysis (Author)

In politic, geopolitical shifts can disrupt the energy transition, as they can transform socio-economic models, trade patterns, and global power dynamics. The transition to net zero emissions could destabilize countries that heavily rely on income from

fossil fuels. International cooperation is needed to manage risks arising from the energy transition (Hammelehle, 2021). In the economy, 2021 and 2022 price hikes allowed Indonesian coal companies to invest in cleaner technologies, increase profitability for environmental compliance, and boost efficiency (Peh, 2022). The process of reaching net-zero emissions has started, and it is already abundantly clear that the path to get there will be challenging. The development of a net-zero workforce that is tailored to the vision and scope of the net-zero portfolio must begin immediately if the goal of minimizing the increase in global temperature to 1.5 degrees Celsius by the year 2050 is to be achieved (Dahl et al., 2022). In order to work towards achieving net-zero goals, in technology sector, it is also likely that CCUS will be required to play a part. Nevertheless, it is of the utmost importance to make certain that CCUS does not continue to rely on fossil fuels and does not contribute to the local harms that are associated with the continued operation of factory or power plants (Lebling et al., 2023). In the environmental perspective, Indonesia has potential to develop renewable energy, located at the equator, has the highest solar potential of all renewable sources with an average generation potential of 4.8-5.1 kWh/m²/day (112,000 GWp/day), making solar energy the lowest cost and most flexible option for the country (Z. Zhu & Wijaya, 2023). In legal aspect, the regulations on the ban of coal-fired power plants can significantly impact the operations of captive power plants, influencing their strategies towards achieving net zero emissions (M. Zhu et al., 2023).

From the listed of driving forces, internal stakeholders of KPC management were asked to rate each force based the impact and the uncertainty level to the company.

Below is the rating result of the driving forces.

Rank	Driving Forces	Impact	Uncertainty	Total (Impact x Uncertainty)
1	Carbon Regulations.	75	60	4500
2	Coal Price Trends.	69	65	4485
3	Global/International Coal Demand.	70	63	4410
4	Regulations on the Ban of Coal-Fired Power Plants for Captive Power Plants.	73	60	4380
5	Coal Sales Royalty Regulations.	72	60	4320
6	Geopolitical Dynamics.	64	66	4224

7	Coal Down-Streaming Technology.	67	63	4221
8	Political Dynamics in Indonesia.	65	63	4095
9	Local/Indonesian Coal Demand.	71	56	3976
10	Carbon Capture, Utilization, and Storage Technology.	66	55	3630
11	Climate Change Trends.	65	51	3315
12	Green Financing Challenge	65	51	3315
13	Advancement in Energy Storage Technology.	61	52	3172
14	Indonesia's Coal Reserves.	70	44	3080
15	Indonesia's GDP Growth.	66	46	3036
16	Renewable Energy Usage Trends in Indonesia.	64	47	3008
17	Pollution Trends in Indonesia.	62	44	2728
18	Community and Customer Aspirations.	57	47	2679
19	Electricity Demand Trend	61	43	2623
20	Distribution and Access to Energy for Communities or Customers.	55	47	2585
21	Qualified Workforce.	78	33	2574

Table IV.2. Result of driving forces rank (Author)

V.1.3 Scenario Creation Stage

After finding the top two driving forces which are considered as the most critical uncertainties. Both forces are described into matrix 2 x 2. This matrix will show each extreme condition for both driving forces. By having this matrix, this study finds four scenarios. In this research, each scenario will be given a name. The names have themes that evoke clear images and emotional responses, it becomes easier for stakeholders to grasp the underlying dynamics and prepare for each possibility.

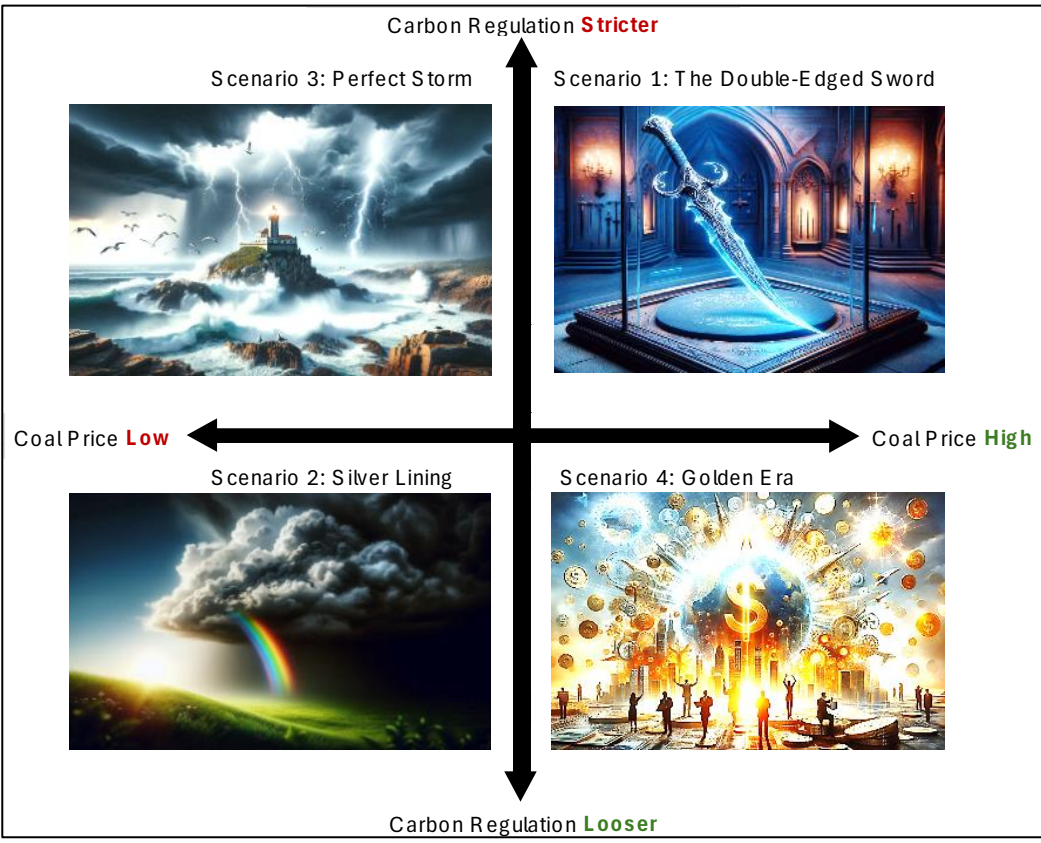


Figure IV.1. Scenarios created from most critical uncertainty (Author)

a. Scenario 1.

Scenario 1 encapsulates the dual nature of circumstances, often referred to metaphorically as “The Double-Edged Sword.”

The metaphor underscores the complexity where advantageous of high coal price are countered by challenging obligations. This dual impact necessitates strategic maneuvering by KPC, balancing economic benefits with the imperative of sustainability mandates. Indonesian coal companies had experienced capitalizing on price hikes, achieving substantial profits in 2021 and Q1 2022, amassing a US\$6.8 billion cash balance to invest in cleaner technologies, enhance profitability for environmental compliance, and drive efficiency improvements (Peh, 2022).

Narrative:

After 2031, KPC finds itself in a complex situation, benefiting from high coal prices while grappling with strict Net Zero Emission (NZE) regulations. The company's increased revenue has enabled significant investments in cleaner technologies, such as carbon capture and advanced emission control systems for their captive power

plant. However, the strict NZE mandates require KPC to carefully balance profitability with environmental responsibility. KPC's strategic investments aim to align with Indonesia's NZE goals, ensuring operational sustainability by reducing their carbon footprint and enhancing efficiency. This dual reality, dubbed "The Double-Edged Sword," highlights the challenging yet necessary journey towards a sustainable future.

b. Scenario 2.

In Scenario 2, "Silver Lining," KPC faces low price but also with relaxed regulatory conditions.

Narrative:

Despite continued low coal prices after 2031, KPC sees a "Silver Lining" in the relaxed regulatory conditions that allow for greater flexibility in operations. This environment provides KPC with the opportunity to explore new business ventures and technologies that support their captive power plant's sustainability. By investing in renewable energy projects and improving energy efficiency, KPC is strategically positioning itself to align with Indonesia's NZE goals. The company's adaptability and forward-thinking approach help them maintain operational stability and discover new growth avenues in a changing energy landscape.

c. Scenario 3.

In Scenario 3, termed "Perfect Storm," KPC confronts a challenging situation characterized by low coal prices diminishing revenue alongside stringent regulations escalating operational costs and complexities. This idiom describes an event where a rare combination of circumstances aggravates a situation drastically. It indicates a convergence of multiple negative factors leading to a dire outcome.

Narrative:

As 2031 unfolds, KPC faces a "Perfect Storm" of challenges, with low coal prices and stringent regulations impacting their financial stability. The company's revenue declines while operational costs rise due to the need for compliance with NZE standards. In response, KPC focuses on upgrading their captive power plant with innovative technologies to reduce emissions and improve efficiency. This challenging period forces KPC to reevaluate its strategies and make difficult decisions to stay afloat. Despite the adverse conditions, KPC's commitment to

sustainability and alignment with Indonesia's NZE goals remains steadfast, highlighting their resilience in a tough market.

d. Scenario 4

In Scenario 4, named “Golden Era,” KPC find high coal price during lenient regulatory conditions, which strengthen the financial performance. The value of coal mining firms is greatly influenced by financial performance, which is measured by profitability and solvency (Azis et al., 2020).

Narrative:

The year 2031 marks the beginning of a "Golden Era" for KPC, characterized by high coal prices and lenient regulatory conditions. This period of prosperity allows KPC to maximize profits and invest heavily in state-of-the-art technologies for their captive power plant. The company leverages this favorable environment to enhance energy efficiency and integrate renewable energy sources, aligning seamlessly with Indonesia's NZE goals. KPC's strategic moves during this time ensure not only financial success but also a strong commitment to sustainability. The "Golden Era" symbolizes a peak in KPC's operations, where minimal constraints and high demand create an ideal scenario for growth and innovation.

V.1.4 Consideration Stage

a. Implications

During this stage, after identifying 4 scenarios which are the most critical scenario for KPC, this study observed the primary and secondary data to see the implications that might happen to the company in each scenario.

The “Double-Edged Sword” scenario implies KPC in several ways. First implication is regulatory pressure. Stricter regulations will increase operational costs to comply with carbon emission limits. For instance, the report “Pathways to 2050: Alternative Scenarios for Decarbonizing the U.S. Economy” mentions that companies are required to reduce greenhouse gas emissions by 80% from 2005 levels by 2050 (Lempert et al., 2019). Next implication is technological advancements. Investment in emission control technology will be necessary to meet regulatory standards. To achieve net-zero CO₂ emissions by 2070, as outlined in the Sustainable Development Scenario, the energy sector must advance

significantly in technology, focusing on energy efficiency and renewable, along with other necessary technologies (IEA, 2021). The third is financial implications. Short-term costs will rise due to compliance and technology investments, but there could be long-term benefits in sustainability. The report “Managing financed emissions: How banks can support the net-zero transition” mentions that banks need to commit to transitioning the emissions from their investment and loan portfolios to align with the net-zero pathway (Azoulay, 2022). The next implication is operational changes. KPC needs to monitor and manage flue gas emissions more rigorously. For instance, the recovery and utilization of waste heat from exhaust gases can provide technical, socio-economic, and environmental benefits (Nyakuma et al., 2023). Another implication is investment shifts, as attracting investors will be challenging without a clear transition plan where net zero emission requires transformational changes and significant investments (Urwin, 2024).

The “Silver Lining” scenario presents a unique set of challenges and opportunities for KPC in the face of low coal prices and relaxed regulations, amidst the global transition towards Net Zero Emissions. The first implication of this scenario is operational changes. The relaxation of regulations could provide KPC with greater operational flexibility. This could allow for strategic adjustments in response to market conditions and regulatory changes. This flexibility could be crucial in maintaining operational efficiency and competitiveness. Next is financial implications which include the potential negative impact of low coal prices on revenue, which could be partially offset by reduced regulatory costs, thereby providing some financial relief amidst the challenges posed by low coal prices. Investment shift challenge also becomes an implication of this scenario. Demonstrating adaptability and resilience in the face of these challenges could potentially attract investments. Investors are increasingly looking for companies that can navigate the transition towards Net Zero Emissions effectively. The fourth implication is technological advancements. The relaxed regulatory environment could provide an opportunity for KPC to gradually invest in cleaner technologies. This could be done without the immediate pressure of regulatory compliance. The last implication of this scenario is reputation and social license. Adapting and innovating in response to market conditions could lead to a positive public

perception. This could enhance KPC's reputation and social license to operate. For example, the idea that a mining company must engage with local communities to obtain a social license to operate (SLO) has become a key concept in the discourse on responsible resource extraction in recent years (Brugger, 2022).

The "Perfect Storm" scenario refers to a challenging situation where low coal prices reduce revenue, and stricter regulations further strain the financial and operational capabilities of KPC post-2031, amidst the global transition towards Net Zero Emissions. The first implication is significant high regulatory pressure. Increased regulatory pressure could lead to higher costs and operational challenges for KPC. In extreme cases, it could even result in the closure of operations at KPC's captive power plant. This could disrupt the supply chain and affect the overall productivity of KPC. Moreover, the need to comply with these regulations could divert resources from other critical areas of the business. Market dynamics goes to lower demand. The low demand for coal could exacerbate the decline in revenue for KPC. This could affect the company's ability to invest in new technologies or infrastructure. Furthermore, the low demand could also impact the company's market share and competitive positioning. Requirement of technological advancements also become the next implication. There is an urgent need for KPC to invest in cleaner technologies to comply with regulations, despite the financial strain. This could require a significant upfront investment, which could strain the company's finances. However, these investments could also lead to long-term cost savings and operational efficiencies. The fourth implication is related to financial implications. KPC could face severe financial stress due to low revenue and high compliance costs, risking operational sustainability. This could affect the company's ability to invest in new projects or technologies. Moreover, it could also impact the company's credit rating, making it more difficult to secure financing for future projects. The fifth implication which is identified in this study is reputation and social license. KPC could potentially face reputational damage if it fails to meet environmental standards. This could affect the company's relationships with stakeholders, including customers, investors, and regulators. Moreover, it could also impact the company's social license to operate, which is increasingly important in today's business environment.

The “Golden Era” scenario refers to a situation where both high coal prices and looser regulations create an optimal environment for revenue growth and operational ease for KPC post-2031, amidst the global transition towards Net Zero Emissions. This scenario has some positive implications. The first is favorable market conditions which could lead to increased profitability for KPC. High coal prices could boost revenue, while the demand for coal remains strong, particularly in emerging markets. This could result in a significant increase in KPC’s profitability. The increased profitability could be used to invest in new projects, technologies, or infrastructure, further enhancing KPC’s market position. Additionally, the strong demand for coal could also provide an opportunity for KPC to expand its market share and reach. Reduced regulatory pressure will imply smoother operations and less compliance-related expenditure for KPC. This could enhance operational efficiency and reduce costs, thereby improving the company’s bottom line. The improved operational efficiency could lead to higher productivity and better utilization of resources. Moreover, the reduced compliance-related expenditure could free up resources that could be invested in other areas of the business, such as research and development or employee training. The next positive implication is financial stability. High revenue with minimal regulatory costs could enhance KPC’s financial health. This could strengthen the company’s financial position and provide a buffer against potential future challenges. The strong financial position could also enhance KPC’s creditworthiness, making it easier for the company to secure financing for future projects. Furthermore, the financial buffer could also provide KPC with the flexibility to navigate any potential market downturns or regulatory changes. The fifth implication is having bigger investment opportunities. The favorable market conditions could make it easier for KPC to attract investments. Investors are likely to be attracted to the strong financial performance and the potential for high returns. The ability to attract investments could provide KPC with the necessary capital to invest in new projects or technologies.

b. Recommendation Option

Below is a list of recommended options for each scenario based on data obtained from the sources, followed by validation in a focus group discussion conducted with internal stakeholders from the captive power plant of PT KPC.

Scenario	Recommendation	Description
Double-Edged Sword (high coal price and strict carbon regulation)	Enhance Operational Efficiency and Productivity	Improving operational efficiency is one of the most cost-effective strategies for reducing emissions and energy consumption. It involves optimizing existing processes and equipment, which can lead to significant savings on fuel costs and lower emissions without the need for large capital investments. This approach is practical and immediately implementable, making it an ideal first step for PT KPC.
	Adoption of Biomass Co-firing	Biomass co-firing involves blending biomass with coal to reduce carbon emissions. This strategy is relatively easy to implement using existing infrastructure with minor modifications. Given the high coal prices, the cost of biomass can be offset, making this an affordable option for PT KPC to comply with strict carbon regulations while still utilizing coal resources efficiently.
	Carbon Credits and Offset Projects	Engaging in carbon credits and offset projects allows PT KPC to offset emissions cost-effectively, comply with strict regulations, and generate additional revenue through carbon trading markets.
	Invest in Renewable Energy Projects	Investing in renewable energy diversifies energy sources and reduces reliance on coal. This positions PT KPC for long-term sustainability and compliance with future regulatory changes while benefiting from high coal prices.

Silver Lining (low coal price and loose carbon regulation)	Enhance Operational Efficiency and Productivity	Maintaining high operational efficiency ensures cost savings and optimal resource use. This is especially important in a low-price environment, as it minimizes operating costs and maximizes the lifespan of existing assets. Improving efficiency is a straightforward and immediate strategy that does not require large capital investments, making it ideal for PT KPC.
	Adoption of Biomass Co-firing	Biomass co-firing reduces emissions and enhances sustainability with minimal upfront costs. It can be implemented using existing coal infrastructure, making it a cost-effective solution for PT KPC to prepare for potential future tightening of regulations without substantial investment.
	Carbon Credits and Offset Projects	Utilizing carbon credits and offset projects can provide financial benefits, allowing PT KPC to prepare for potential future tightening of regulations without immediate heavy investment in emission reduction technologies.
	Leverage External Funding and Partnerships for Renewable Energy Projects	Seeking external funding and partnerships mitigates financial constraints and allows PT KPC to invest in sustainable energy projects, preparing for potential future regulatory changes and enhancing long-term sustainability.
Perfect Storm (low coal price and strict carbon regulation)	Enhance Operational Efficiency and Productivity	Enhancing efficiency reduces costs and emissions, helping PT KPC comply with stringent regulations and maintain financial viability under challenging market conditions. This approach is cost-effective as it focuses on optimizing existing operations without requiring significant new investments.
	Adoption of Biomass Co-firing	Biomass co-firing offers a cost-effective way to meet strict carbon regulations and reduce emissions, essential for PT KPC's compliance in a financially constrained environment. The existing coal infrastructure can be

		used with minor modifications, making it an affordable and practical solution.
	Carbon Credits and Offset Projects	Engaging in carbon credits and offset projects helps PT KPC meet strict regulatory requirements affordably, providing flexibility and additional revenue opportunities in a low-price market.
	Retirement of Captive Power Plants & Take Electricity from PLN	Retiring less efficient captive power plants and sourcing electricity from PLN can reduce operational costs and emissions, ensuring compliance with strict regulations while optimizing financial resources.
	Leverage External Funding and Partnerships for Renewable Energy Projects	External funding and partnerships facilitate the transition to renewable energy, essential for long-term compliance and financial stability, especially under strict regulations and financial constraints.
Golden Era (high coal price and loose carbon regulation)	Enhance Operational Efficiency and Productivity	Improving efficiency ensures cost savings and optimal use of high coal prices, maintaining profitability and operational excellence for PT KPC. This strategy is straightforward to implement and provides immediate financial benefits, making it highly practical.
	Adoption of Biomass Co-firing	Biomass co-firing enhances sustainability and reduces emissions, beneficial for PT KPC even with lenient regulations. Leveraging high coal prices allows for cost-effective biomass procurement, making this an easy and profitable solution.
	Carbon Credits and Offset Projects	Utilizing carbon credits and offset projects provides financial benefits and aligns with PT KPC's future sustainability goals, despite lenient current regulations.
	Invest in Renewable Energy Projects	Investing in renewables diversifies energy sources and reduces long-term reliance on coal, positioning PT KPC

		as a leader in sustainability and future compliance with stricter regulations.
	Implement Carbon Capture, Utilization, and Storage (CCUS)	Investing in CCUS technology can significantly reduce emissions while allowing continued use of coal, aligning PT KPC with future regulatory tightening and long-term sustainability objectives.

Table IV.3. Recommendation option for each scenario (Author)

The implications of the Double-Edged Sword scenario, which involves high coal prices and strict carbon regulations, can be effectively managed through a combination of strategic recommendations. Regulatory pressure, which heightens operational costs to meet carbon emission limits, can be alleviated by adopting biomass co-firing, thereby reducing emissions while utilizing high coal prices to sustain profitability. The necessity for technological advancements to comply with stringent standards can be addressed by investing in renewable energy projects, fostering long-term sustainability and diminishing reliance on coal. Financial implications arising from the need for compliance and technological investments can be mitigated by engaging in carbon credits and offset projects, offering a cost-effective means to offset emissions and generate additional revenue. Operational changes, such as rigorous monitoring and management of flue gas emissions, can be tackled by enhancing operational efficiency and productivity, thus reducing energy consumption and emissions without substantial capital outlay. Lastly, investment shifts required to attract investors can be achieved by demonstrating a clear transition plan towards net-zero emissions, underpinned by investments in renewable energy and innovative emission control technologies, positioning PT KPC for enduring sustainability and regulatory compliance.

In the "Silver Lining" scenario, where low coal prices and loose carbon regulations prevail, the identified implications can be effectively managed through strategic recommendations. Operational changes, necessitated by the flexibility provided by relaxed regulations, can be optimized by enhancing operational efficiency and productivity, ensuring competitiveness and cost-effectiveness in a low-price environment. Financial implications, including potential revenue decline due to low

coal prices, can be partially offset by the adoption of biomass co-firing, which provides an affordable way to reduce emissions using existing infrastructure. Investment shifts, driven by the need to demonstrate adaptability and resilience, can be supported by leveraging external funding and partnerships for renewable energy projects, thereby mitigating financial constraints while investing in sustainability. Technological advancements can be pursued gradually without immediate regulatory pressure, aligning with the adoption of biomass co-firing and leveraging external funding. Lastly, enhancing operational efficiency and engaging in carbon credits and offset projects can bolster PT KPC's reputation and social license, showcasing the company's commitment to innovation and sustainability despite lenient regulations. These recommendations collectively ensure that PT KPC navigates this scenario effectively, maintaining operational excellence and long-term sustainability.

In the "Perfect Storm" scenario, characterized by low coal prices and strict carbon regulations, PT KPC can address the resulting implications through a series of strategic recommendations. Regulatory pressure, which significantly increases compliance costs, can be managed by enhancing operational efficiency and productivity, thereby reducing energy consumption and emissions at minimal cost. The adverse market dynamics, marked by declining coal demand and revenue, can be mitigated by adopting biomass co-firing, which utilizes existing infrastructure to reduce emissions affordably. Technological advancements needed to comply with stringent regulations can be supported by leveraging external funding and partnerships for renewable energy projects, easing the financial burden on PT KPC. Financial implications, including severe financial stress due to low revenue and high compliance costs, can be alleviated by engaging in carbon credits and offset projects, providing a cost-effective way to meet regulatory requirements and generate additional revenue. Lastly, the potential reputational damage from failing to meet environmental standards can be addressed by retiring less efficient captive power plants and sourcing electricity from PLN, demonstrating a commitment to sustainability and improving the company's social license to operate. These recommendations collectively ensure that PT KPC can navigate this challenging

scenario while maintaining compliance, financial stability, and a positive reputation.

In the "Golden Era" scenario, characterized by high coal prices and loose carbon regulations, PT KPC can capitalize on favorable market conditions and reduced regulatory pressure through strategic recommendations. Enhancing operational efficiency and productivity will allow PT KPC to maximize profitability and resource utilization, ensuring sustained financial stability in a high-revenue environment. The adoption of biomass co-firing can further reduce emissions cost-effectively, leveraging high coal prices for better financial returns. Engaging in carbon credits and offset projects provides additional revenue streams and prepares PT KPC for future regulatory tightening. Investing in renewable energy projects not only diversifies energy sources and enhances sustainability but also positions PT KPC as a forward-thinking leader in the industry, attracting investment opportunities. Finally, implementing Carbon Capture, Utilization, and Storage (CCUS) technology can significantly reduce emissions, aligning with global sustainability goals and demonstrating a commitment to long-term environmental responsibility. These recommendations ensure that PT KPC leverages its strong market position and financial health to achieve operational excellence and sustainability amidst lenient carbon regulations.

V.1.5 Integration Stage

In the final stage of the scenario planning process, to emphasize governance in the company, the process of signaling each plausible scenario should be systematized into what this research will call an Early Warning System. This system helps the company observe and analyze environmental drivers that indicate if a particular scenario is unfolding. These systems are developed by identifying key drivers during the scenario planning process, as insights about impactful mechanisms are most relevant at that time.

The drivers are categorized using the PESTEL framework to comprehensively view all driving forces identified during the exploratory stage of scenario planning. Additionally, the system includes an iterative action plan, as shown in Figure IV.2,

to ensure continuous monitoring and control. This plan outlines specific actions and assigns responsible personnel for each task.

Category	Signals	Indicators	
		Scenario 1 Double-Edged Sword	Scenario 2 Silver Lining
Political	Changes in government policies, international agreements on emissions, and regulatory shifts.	Strong international climate agreements, heavy penalties for emissions, subsidies for clean technologies.	Government subsidies for coal industry, weak international climate agreements, reduced emissions regulations.
Economic	Fluctuations in global economic growth, shifts in energy consumption patterns, and changes in commodity prices.	High global demand for energy, especially from industrializing nations, but high costs due to carbon taxes and compliance.	Low global economic growth, reduced demand for energy, low operational costs due to fewer regulations.
Social	Public opinion and environmental awareness, consumer preferences for sustainable energy sources.	High public demand for sustainable energy, strong opposition to coal, social pressure leading to stricter regulations.	Low public interest in environmental sustainability, continued acceptance of coal as a primary energy source.
Technological	Advancements in renewable energy technologies, improvements in energy storage solutions, and developments in carbon capture and storage (CCS).	Rapid advancements in CCS, increased efficiency in renewable energy technologies, high costs for coal due to need for emissions technology.	Slow technological advancements in renewables, low investment in CCS, coal remains a cost-effective energy source.

Environmental	Climate change impacts, frequency of natural disasters, and global temperature trends.	Frequent extreme weather events, strong regulatory responses to climate change, high costs for coal due to environmental compliance.	Few extreme weather events, relaxed regulatory environment, low costs for coal.
Legal	Introduction of new laws and regulations, changes in existing environmental and mining laws, and international trade policies.	Strict environmental laws, high penalties for non-compliance, increased operational costs for coal companies.	Relaxed environmental laws, minimal penalties for non-compliance, low operational costs for coal companies.

Table IV.4. Early warning signal for Scenario 1 and 2 (Author)

Category	Signals	Indicators	
		Scenario 3 Perfect Storm	Scenario 4 Golden Era
Political	Changes in government policies, international agreements on emissions, and regulatory shifts.	Strong international climate agreements, heavy penalties for emissions, but significant reductions in coal subsidies.	Government support for coal, minimal regulations on emissions, subsidies for fossil fuel exploration.
Economic	Fluctuations in global economic growth, shifts in energy consumption patterns, and changes in commodity prices.	Low global economic growth, reduced demand for energy, high costs due to carbon taxes and compliance.	High global economic growth, increased demand for energy, low operational costs due to minimal regulations.

Social	Public opinion and environmental awareness, consumer preferences for sustainable energy sources.	High public demand for sustainable energy, strong opposition to coal, leading to high costs and reduced demand.	Low public interest in environmental sustainability, continued acceptance and preference for coal energy.
Technological	Advancements in renewable energy technologies, improvements in energy storage solutions, and developments in carbon capture and storage (CCS).	Rapid advancements in CCS and renewables, high costs for coal due to need for emissions technology, limited market competitiveness.	Slow technological advancements in renewables, minimal investment in CCS, coal remains a dominant and profitable energy source.
Environmental	Climate change impacts, frequency of natural disasters, and global temperature trends.	Frequent extreme weather events, strong regulatory responses to climate change, high costs and low demand for coal.	Few extreme weather events, relaxed regulatory environment, low costs for coal, high profitability.
Legal	Introduction of new laws and regulations, changes in existing environmental and mining laws, and international trade policies.	Strict environmental laws, high penalties for non-compliance, increased operational costs, reduced market for coal.	Relaxed environmental laws, minimal penalties for non-compliance, low operational costs, high profitability for coal companies.

Table IV.5. Early warning signal for Scenario 3 and 4 (Author)

V.2 Business Solution

Given the multifaceted challenges faced by PT KPC's captive power plant amidst the drive towards net zero emissions, scenario planning emerges as a robust and logical business solution. Scenario planning enables KPC to anticipate and prepare for a range of possible futures by systematically considering various environmental, political, economic, social, technological, and legal factors that may impact the coal industry. By developing multiple scenarios, KPC can evaluate the potential outcomes of different strategic decisions. This method provides a structured approach to navigate uncertainties, identify risks and opportunities, and develop contingency plans, ensuring that KPC remains resilient and adaptable in the face of evolving global energy landscapes.

Furthermore, scenario planning allows KPC to align its strategies with international climate agreements and stakeholder expectations, thereby mitigating reputational risks and securing market access. By exploring scenarios that incorporate strict carbon regulations and fluctuating coal prices, KPC can devise strategies to optimize its operational efficiency and financial stability under varying regulatory and market conditions. This proactive approach not only enhances decision-making but also positions KPC to capitalize on emerging technologies and funding opportunities in the renewable energy sector. In summary, scenario planning equips PT KPC's captive power plant with the tools to effectively manage future uncertainties and maintain competitiveness beyond 2031, aligning its operations with global sustainability goals.

V.3 Implementation & Justification

Based on the analysis conducted, guidance was obtained for PT KPC's captive power plant to anticipate the future post 2031. The implementation of the analysis results is outlined in a scheduled implementation plan. This implementation plan is the result of agreements made during the focus group discussion with internal stakeholders at the captive power plant PT KPC.

In general, there are two parts to the implementation schedule. The first part is the schedule for the continuation of the scenario planning process, which must be regularly monitored and evaluated. The overall scenario planning process needs to be repeated every 3 to 4 years, as not all parameters or indicators may be fully known at the time the scenario planning is conducted (Haigh, 2019). This is to ensure that the scenario planning project remains relevant to the factual conditions and aligns with the company's program of regularly evaluating corporate strategy. The second part is the implementation schedule for three recommended projects that are relevant to all four scenarios in pursuing net zero emissions, whether in conditions of rising or falling coal prices and whether regulations are strict or lenient. Other recommended options cannot be determined at this time, as there is still a need to monitor the early warning signals that will become apparent in the coming period.

Task	PIC	2024				2025				2026				2027				2028			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Scenario Planning, Monitoring, and Evaluation																					
Identify and Analyze Driving Forces	Strategy and Planning Team Power Plant	X																			
Data Collection and Analysis	Strategy and Planning Team Power Plant	X																			
Develop Initial Scenarios	Strategy and Planning Team Power Plant		X																		
Establish Early Warning Signals	Strategy and Planning Team Power Plant			X																	
Strategy Formulation	Strategy and Planning Team Power Plant			X																	
Regular Review of Early Warning Signals	Strategy and Planning Team Power Plant				X			X													
Adjust Scenarios Based on New Data	Strategy and Planning Team Power Plant					X				X											
Prepare and Execute Adjusted Strategies	Strategy and Planning Team Power Plant				X	X				X	X										
Project Proposal & Approval	Manager Power Plant, Manager Business Analyst, COO, CFO, CEO					X	X				X	X									
Scenario Planning Re-evaluation	Strategy and Planning Team Power Plant												X	X							
Enhance Operational Efficiency and Productivity																					
Conduct operational audit	Manager O&M Power Plant, Manager Engineering Power Plant					X	X														
Identify inefficiencies and areas for improvement	Manager O&M Power Plant, Supt Maintenance					X	X														
Develop and implement improvement plans	Manager O&M Power Plant, Supt Operation					X	X														
Train staff on new procedures and technologies	Manager Human Resource, Electrical Engineering Advisor							X	X	X											
Monitor and evaluate improvements	Supt Operation, Senior Engineer Operation									X	X	X	X	X	X	X	X	X	X	X	X
Continuous improvement and feedback loop	Manager O&M Power Plant, Supervisor Operation										X	X	X	X	X	X	X	X	X	X	X
Adoption of Biomass Co-firing																					
Conduct feasibility study	Manager Engineering Power Plant, Supt Maintenance			X	X	X	X														
Identify suitable biomass sources	Manager Environment, Supt HSES				X	X	X	X													
Develop biomass supply chain	Manager Environment, Manager Supply, Manager Business Analyst, Supt Finance							X	X												
Pilot biomass co-firing project (only in 2x5MW Power Plant)	Manager Engineering Power Plant, Engineer Operation								X	X	X										
Evaluate pilot project results	Supt Operation, Senior Engineer Operation									X	X										
Scale up biomass co-firing (including 3x18MW Power Plant)	Manager Engineering Power Plant, Supt Operation										X	X	X								
Continuous monitoring and optimization	Supt Operation, Engineer Operation										X	X	X	X	X	X	X	X	X	X	X
Carbon Credits and Offset Projects																					
Identify potential carbon credit opportunities	Manager Energy, Manager Business Analyst			X	X																
Study of current carbon baseline	Manager Power Plant			X	X	X	X	X	X												
Develop and register offset projects	Manager Energy, Manager Environment			X	X																
Engage with stakeholders for project support	Manager Energy, Manager Environment, Manager Power Plant, Manager Business Analyst				X	X															
Implement offset projects	Manager Energy, Manager Environment, Manager Power Plant, Finance				X	X	X														
Monitor and verify carbon credits	Manager Energy, Manager Environment, Manager Power Plant, Finance					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Continuous reporting and certification	Manager Energy, Manager External									X	X	X	X	X	X	X	X	X	X	X	X

Figure IV.2. Scenario planning implementation plan of captive power plant PT KPC (Author)

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Chapter VI Conclusion and Recommendation

VI.1 Conclusion

Based on the scenario planning analysis, PT KPC's captive power plant can effectively navigate the uncertainties and challenges posed by the global transition towards net zero emissions. The key research questions outlined in Chapter 1 have been addressed through a systematic and thorough analysis, leading to actionable strategies and recommendations for the future.

- a. This research has found the driving forces leading to uncertainty. The critical uncertainties impacting PT KPC's captive power plant include fluctuating coal prices and varying levels of carbon regulation. These driving forces were identified as the most significant due to their high impact and unpredictability. The analysis revealed that geopolitical dynamics, local coal demand, global coal demand, and technological advancements in energy storage and carbon capture are among the key forces shaping the future landscape for PT KPC.
- b. Plausible scenarios and their implications were revealed. Four scenarios were developed to explore the potential future conditions for PT KPC's captive power plant:
 - Double-Edged Sword: High coal prices with strict carbon regulations.
 - Silver Lining: Low coal prices with relaxed carbon regulations.
 - Perfect Storm: Low coal prices with strict carbon regulations.
 - Golden Era: High coal prices with relaxed carbon regulations.Each scenario presented unique implications for operational efficiency, financial stability, technological investments, and regulatory compliance. These scenarios provided a comprehensive understanding of how different combinations of market and regulatory conditions could affect PT KPC's operations.
- c. Set of strategic recommendations were established to address the challenges and opportunities identified in each scenario. There are several strategic

recommendations were formulated and generally relevant for use in all scenarios.

- **Enhancing Operational Efficiency and Productivity:** A consistent recommendation across all scenarios, emphasizing the importance of optimizing current processes to reduce costs and emissions.
- **Adopting Biomass Co-firing:** A practical strategy to lower carbon emissions using existing infrastructure.
- **Engaging in Carbon Credits and Offset Projects:** Providing financial benefits and regulatory compliance flexibility.

In conclusion, by adopting a scenario planning approach, PT KPC's captive power plant can proactively prepare for future uncertainties, effectively enhancing operational efficiency, investing in sustainable technologies, and ensuring compliance with evolving regulations. Early warning signals such as changes in government policies, economic growth, public opinion on sustainability, technological advancements, and environmental impacts will help PT KPC monitor and adapt to emerging trends. The implementation plan emphasizes regular monitoring and prioritizes projects relevant to all scenarios to pursue net zero emissions effectively. By implementing these strategies, PT KPC will align with Indonesia's Net Zero Emission goals beyond 2031, maintaining resilience and competitiveness amid global energy transitions.

VI.2 Recommendation

Here are several recommendations that can be implemented following this study,

- a. Several strategies have been recommended, with emphasis on those that remain relevant across all scenarios. These strategies can be prioritized for immediate implementation.
- b. It is crucial to establish a process for regular monitoring and evaluation of the identified early warning signals. This will enable PT KPC to adapt and respond to emerging trends effectively.

- c. The scenario planning process should be revisited every three to four years to identify any new driving forces that may have emerged and ensure that the strategic plan remains current and effective.
- d. For the future research recommendations, further detailed and scientific evaluations of each recommended strategic projects are necessary. Future research should focus on assessing these projects to determine the most beneficial options, particularly from both short-term and long-term financial perspectives

REFERENCES

- Ajayi, V. O. (2023). *A Review on Primary Sources of Data and Secondary Sources of Data* (Vol. 2). www.ej-edu.orgDOI:http://dx.doi.org/19810.21091/
- Alandejani, M., & Al-Shaer, H. (2023). Macro Uncertainty Impacts on ESG Performance and Carbon Emission Reduction Targets. *Sustainability*, *15*(5), 4249. <https://doi.org/10.3390/su15054249>
- Arend, R. J. (2024). *Uncertainty in Strategic Decision Making Analysis, Categorization, Causation and Resolution*. Palgrave Macmillan. <https://doi.org/https://doi.org/10.1007/978-3-031-48553-4>
- Azis, M., Hastriawan, H., Kasuma, J., & Darma, D. C. (2020). COAL PRICES AND FINANCIAL PERFORMANCE TOWARD COAL MINING COMPANY VALUE. *International Journal of Psychosocial Rehabilitation*, *24*.
- Azoulay, M. (2022, November 22). *Managing financed emissions: How banks can support the net-zero transition*. www.mckinsey.com. <https://www.mckinsey.com/industries/financial-services/our-insights/managing-financed-emissions-how-banks-can-support-the-net-zero-transition>
- Bößner, S., Fauzi, D., & Rimal, P. (2023). *A just coal transition in Indonesia: actors, framings and future directions*. <https://doi.org/10.51414/sei2023.051>
- Breakwell, G. M. (2023). Choosing a Research Design. In A. L. Nichols & J. Edlund (Eds.), *The Cambridge Handbook of Research Methods and Statistics for the Social and Behavioral Sciences* (1st ed., Vol. 1, pp. 85–102). Cambridge University Press. <https://doi.org/10.1017/9781009010054>
- Brugger, F. (2022). *How the Energy Transition Redefines the Social License to Operate* (pp. 1–24). https://doi.org/10.1007/978-3-030-74725-1_14-1
- Calvin, K., Dasgupta, D., Krinner, G., Mukherji, A., Thorne, P. W., Trisos, C., Romero, J., Aldunce, P., Barrett, K., Blanco, G., Cheung, W. W. L., Connors, S., Denton, F., Diongue-Niang, A., Dodman, D., Garschagen, M., Geden, O., Hayward, B., Jones, C., ... Ha, M. (2023). *IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland.* (P. Arias, M. Bustamante, I. Elgizouli, G. Flato, M. Howden, C. Méndez-Vallejo, J. J. Pereira, R. Pichs-Madruga, S. K. Rose, Y. Saheb, R. Sánchez Rodríguez, D. Ürgé-Vorsatz, C. Xiao, N. Yassaa, J. Romero, J. Kim, E. F. Haites, Y. Jung, R. Stavins, ... C. Péan, Eds.). <https://doi.org/10.59327/IPCC/AR6-9789291691647>
- Choi, S., Furceri, D., Huang, Y., & Loungani, P. (2016). Aggregate Uncertainty and Sectoral Productivity Growth: The Role of Credit Constraints. *IMF Working Papers*, *16*(174), 1. <https://doi.org/10.5089/9781475526370.001>

- Couclelis, H. (2011). Risky business: climate control legislation, regional development uncertainties and California's SB 375 law. *International Journal of Foresight and Innovation Policy*, 7(1/2/3), 158. <https://doi.org/10.1504/IJFIP.2011.040072>
- Creswell, J. W. (2023). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*.
- Dahl, J., Gaudet, É., Rockhill, D., & Westney, R. (2022, June 9). *Building the net-zero workforce*. McKinsey & Company. <https://www.mckinsey.com/capabilities/operations/our-insights/global-infrastructure-initiative/voices/building-the-net-zero-workforce#/>
- Deng, J., Huang, S., Wang, L., Deng, W., & Yang, T. (2022). Conceptual Framework for Smart Health: A Multi-Dimensional Model Using IPO Logic to Link Drivers and Outcomes. *International Journal of Environmental Research and Public Health*, 19(24), 16742. <https://doi.org/10.3390/ijerph192416742>
- Dunn, S. L., Arslanian-Engoren, C., DeKoekkoek, T., Jadack, R., & Scott, L. D. (2015). Secondary Data Analysis as an Efficient and Effective Approach to Nursing Research. *Western Journal of Nursing Research*, 37(10), 1295–1307. <https://doi.org/10.1177/0193945915570042>
- Ellis, D. (2020). Developing a strategic framework of analysis for air transport management. *Transportation Research Procedia*, 51, 217–224. <https://doi.org/10.1016/j.trpro.2020.11.024>
- Garvin, D. A., & Levesque, L. (2006, July 31). A Note on Scenario Planning. *Harvard Business School Background Note 306-003*.
- GGGI. (2021, October 7). *INDONESIA'S UPDATED NDC FOR A CLIMATE RESILIENT FUTURE*. GGGI. <https://gggi.org/indonesias-updated-ndc-for-a-climate-resilient-future/>
- Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: interviews and focus groups. *British Dental Journal*, 204(6), 291–295. <https://doi.org/10.1038/bdj.2008.192>
- González Ortega, R., David Oviedo Rodríguez, M., Leyva Vázquez, M., Ricardo, J. E., Alcione, J., Figueiredo, S., & Smarandache, F. (2019). *Pestel analysis based on neutrosophic cognitive maps and neutrosophic numbers for the sinos river basin management*. <http://www.mentalmodeler.org/>
- Haigh, N. (2019). *Scenario planning for climate change : a guide for strategists*. www.GlobalOptimism.com
- Hammelehle, J. (2021, July 20). *Power Shifts: On the Geopolitics of the Energy Transition*. Munich Security Conference. <https://securityconference.org/en/media/msc-blog/article/power-shifts-geopolitics-energy-transition/>
- Hansen, M., & Slaughter, K. (2015, February). *The future of coal: Applying scenario planning to a critical issue*. www.Westernplanner.Org.

- Hasan, K. (2023, September 23). *Emerging captive coal power: Dark clouds on Indonesia's clean energy horizon*. CREA. <https://energyandcleanair.org/publication/emerging-captive-coal-power-in-indonesia/>
- Hlatshwayo, S. (2017). *Unpacking Policy Uncertainty: Evidence from European Firms*. www.sandile.com.
- Hofman, K. (2018). *A Qualitative Study into the Theoretical and Practical Side of the SWOT-analysis and Scenario Planning*. University of Twente.
- IEA. (2020). *The Role of CCUS in Low-Carbon Power Systems*.
- IEA. (2021). *Energy Technology Perspectives 2020*. www.iea.org/t&c/
- Inoue, H., Kani, M., & Nakashima, K. (2019). *The Dynamic Effect of Uncertainty on Corporate Investment through Internal and External Financing The Dynamic Effect of Uncertainty on Corporate Investment through Internal and External Financing **.
- IRENA. (2023). *Geopolitics of the Energy Transition: Critical Materials*. International Renewable Energy Agency. www.irena.org
- Jakob, M., Steckel, J. C., Jotzo, F., Sovacool, B. K., Cornelsen, L., Chandra, R., Edenhofer, O., Holden, C., Löschel, A., Nace, T., Robins, N., Suedekum, J., & Urpelainen, J. (2020). The future of coal in a carbon-constrained climate. *Nature Climate Change*, 10(8), 704–707. <https://doi.org/10.1038/s41558-020-0866-1>
- Jennifer. (2023). *Indonesia's Coal Emissions at Record High, Up 33% in 2022*. Carbon Credits. <https://carboncredits.com/indonesia-coal-emissions-at-record-high-up-33-in-2022/>
- Jong, H. N. (2023, July 3). *Indonesia's coal burning hits record high — and 'green' nickel is largely why*. Mongabay. <https://news.mongabay.com/2023/07/indonesias-coal-burning-hits-record-high-and-green-nickel-is-largely-why/>
- Kabir, S. M. S. (2016). *Basic Guidelines for Research: An Introductory Approach for All Disciplines* (1st ed.). Book Zone.
- Larasati, L. K., & Mafira, T. (2023, August 14). *The Net Zero Alignment of Indonesia's Power Sector Finance*. CPI.
- Lawrence, D. J., Runyon, A. N., Gross, J. E., Schuurman, G. W., & Miller, B. W. (2021). Divergent, plausible, and relevant climate futures for near- and long-term resource planning. *Climatic Change*, 167(3–4), 38. <https://doi.org/10.1007/s10584-021-03169-y>
- Lebling, K., Gangotra, A., Hausker, K., & Byrum, Z. (2023, November 13). *7 Things to Know About Carbon Capture, Utilization and Sequestration*. World Resources Institute. <https://www.wri.org/insights/carbon-capture-technology>

- Lee, S., & Klassen, R. D. (2016). Firms' Response to Climate Change: The Interplay of Business Uncertainty and Organizational Capabilities. *Business Strategy and the Environment*, 25(8), 577–592. <https://doi.org/10.1002/bse.1890>
- Lempert, R., Preston, B. L., Edmonds, J., Clarke, L., Wild, T., Binsted, M., Diringer, E., & Townsend, B. (2019). *Pathways to 2050 Alternative Scenarios for Decarbonizing the U.S. Economy*.
- Lindgren, M., & Bandhold, H. (2003). *Scenario Planning: The link between future and strategy* (1st ed.). Palgrave Macmillan.
- Marcus, A. (2019). *Strategies for Managing Uncertainty*. Cambridge University Press. <https://doi.org/10.1017/9781108120586>
- Marshall, B., Cardon, P., Poddar, A., & Fontenot, R. (2013). Does Sample Size Matter in Qualitative Research?: A Review of Qualitative Interviews in is Research. *Journal of Computer Information Systems*, 54(1), 11–22. <https://doi.org/10.1080/08874417.2013.11645667>
- Masayuki, M. (2013). What Type of Policy Uncertainty Matters for Business? In *RIETI Discussion Paper Series* (13-E-076).
- Met Office. (2023, August). *Causes of climate change*. [www.Metoffice.Gov.Uk](http://www.metoffice.gov.uk). <https://www.metoffice.gov.uk/weather/climate-change/causes-of-climate-change>
- Ministry of Energy and Mineral Resources Republic of Indonesia. (2024). *Handbook of Energy & Economic Statistics of Indonesia*. ESDM.
- Mortlock, L. (2021). *Disaster Proof: Scenario Planning for a Post-Pandemic Future*. Barlow Book.
- Muzakki, W. (2023, December 6). *Implementasi Pajak Karbon Pasca-Berlakunya Bursa Karbon*. Direktorat Jenderal Pajak. <https://www.pajak.go.id/index.php/id/artikel/implementasi-pajak-karbon-pasca-berlakunya-bursa-karbon>
- Natalia, D., Yoesgiantoro, D., & Yusgiantoro, F. C. (2022). Projection of Coal-Fired Power Plant (CFPP) Towards Net Zero Emission 2060 in Indonesia. *International Journal of Research and Innovation in Social Science*, 06(05), 465–471. <https://doi.org/10.47772/IJRISS.2022.6523>
- Nyakuma, B. B., Mahyon, N. I., Chiong, M. S., Rajoo, S., Pesiridis, A., Wong, S. L., & Martinez-Botas, R. (2023). Recovery and utilisation of waste heat from flue/exhaust gases: a bibliometric analysis (2010–2022). *Environmental Science and Pollution Research*, 30(39), 90522–90546. <https://doi.org/10.1007/s11356-023-28791-4>
- Ordonez, J. A., Jakob, M., Steckel, J. C., & Fünfgeld, A. (2021). Coal, power and coal-powered politics in Indonesia. *Environmental Science & Policy*, 123, 44–57. <https://doi.org/10.1016/j.envsci.2021.05.007>
- Peh, G. (2022). *High Coal Prices Could Boost Indonesia's Energy Transition*.

- Peraturan Presiden (Perpres) Republik Indonesia Nomor 22 Tahun 2017 Tentang Rencana Umum Energi Nasional, Pub. L. No. 22, Sekretariat Kabinet RI (2017).
- Peraturan Presiden (Perpres) Republik Indonesia Nomor 112 Tahun 2022 Tentang Percepatan Pengembangan Energi Terbarukan Untuk Penyediaan Tenaga Listrik, Pub. L. No. 112, Sekretariat Kabinet RI 1 (2022).
- Peterson, G. D., Cumming, G. S., & Carpenter, S. R. (2003). Scenario Planning: a Tool for Conservation in an Uncertain World. *Conservation Biology*, 17(2), 358–366. <https://doi.org/10.1046/j.1523-1739.2003.01491.x>
- PPID. (2016, April 23). *Indonesia Signs Paris Agreement On Climate Change*. https://ppid.menlhk.go.id/siaran_pers/browse/299
- Pradhana, A. (2016). *Private Power Utilities: Economic Benefits of Captive Power in Industrial Estates in Indonesia*. www.pwc.com/id
- Purwanti, T. (2022, October 13). *Pajak Karbon Ditunda Sampai 2025*. CNBC Indonesia.
- Putri, C. A. (2022, June 27). *Pajak Karbon Batal Berlaku 1 Juli, Sri Mulyani Buka Suara*. CNBC Indonesia.
- Ren, X., Li, W., Duan, K., & Zhang, X. (2022). Does climate policy uncertainty really affect corporate financialization? *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4079217>
- Roesad, K. (2023, April 11). *Indonesia's underwhelming renewable energy reform*. East Asia Forum. <https://eastasiaforum.org/2023/04/11/indonesias-underwhelming-renewable-energy-reform/>
- Saldaña, J. (2011). *Fundamentals of Qualitative Research*. Oxford University Press.
- Saldaña, J., & Omasta, M. (2018). *Qualitative Research: Analyzing Life* (1st ed.). SAGE Publications.
- Schoemaker, P. J. H. (1995). Scenario Planning: A Tool for Strategic Thinking. *MIT Sloan Management Review*, 25–40.
- Schoemaker, P. J. H., & van der Heijden, C. A. J. M. (1992). Integrating scenarios into strategic planning at Royal Dutch/Shell. *Planning Review*, 20(3), 41–46. <https://doi.org/10.1108/eb054360>
- Schwartz, P. (1996). *The Art of the Long View* (1st ed.). Bantam Doubleday Dell.
- Schwartz, P., & Randall, D. (2003). *An Abrupt Climate Change Scenario and Its Implications for United States National Security*.
- Sekaringtias, A., Verrier, B., & Cronin, J. (2023). Untangling the socio-political knots: A systems view on Indonesia's inclusive energy transitions. *Energy Research & Social Science*, 95, 102911. <https://doi.org/10.1016/j.erss.2022.102911>

- Shahnazari, M., & Mchugh, A. (2014). *Power investment decisions under uncertain carbon policy: The effect of anticipated repeal and reinstatement of regulations*. <http://researchrepository.murdoch.edu.au/22687/>
- Shmidt, A. V., & Khudyakova, T. A. (2015). Analysis of the Influence of the Uncertainty of the External Environment on the Financial and Economic Sustainability of Industrial Enterprises. *Mediterranean Journal of Social Sciences*. <https://doi.org/10.5901/mjss.2015.v6n6s2p465>
- Simanjuntak, U., & Hasjanah, K. (2023, December 29). *Indonesia's Emission Reduction Ambition Needs to Increase*. IESR. <https://iesr.or.id/en/indonesias-emission-reduction-ambition-needs-to-increase>
- Siraj, H.-. (2019). Indonesian Policy in Ratifying The 2015 Paris Agreement. *Global: Jurnal Politik Internasional*, 21(1), 70. <https://doi.org/10.7454/global.v21i1.353>
- Song, J., Sun, Y., & Jin, L. (2017). PESTEL analysis of the development of the waste-to-energy incineration industry in China. *Renewable and Sustainable Energy Reviews*, 80, 276–289. <https://doi.org/10.1016/j.rser.2017.05.066>
- Suwatno, D. S. R. (2023). Ratifikasi terhadap Traktat Persetujuan Paris (Paris Agreement) sebagai Wujud Implementasi Komitmen Indonesia dalam Upaya Mitigasi dan Adaptasi Perubahan Iklim. *Jurnal Pendidikan Kewarganegaraan Undiksha*, 10(2), 328–340. <https://doi.org/10.23887/jpku.v10i2.47076>
- Terosky, A. L., Baker, V. L., & Sun, J. C. (2023). *A Practical Guide to Teaching Research Methods in Education*. Routledge. <https://doi.org/10.4324/b23320>
- Thakur, V. (2021). Framework for PESTEL dimensions of sustainable healthcare waste management: Learnings from COVID-19 outbreak. *Journal of Cleaner Production*, 287, 125562. <https://doi.org/10.1016/j.jclepro.2020.125562>
- The World Bank Group. (2021). *What is Climate Change ?* [Climateknowledgeportal.Worldbank.Org](https://climateknowledgeportal.worldbank.org/). <https://climateknowledgeportal.worldbank.org/overview>
- Tuff, G., & Helmi, T. (2020). *The Future of Energy*.
- Turner, S. F., Cardinal, L. B., & Burton, R. M. (2017). Research Design for Mixed Methods. *Organizational Research Methods*, 20(2), 243–267. <https://doi.org/10.1177/1094428115610808>
- UNFCCC. (2016). *The Paris Agreement*.
- Urwin, R. (2024). *Net Zero in the Balance: A Guide to Transformative Industry Thinking*. www.cfainstitute.org.
- Wehnert, T., Andreeva, T., Fekete, H., Lütkehermöller, K., Luna, L., & Vieweg, M. (2019). *Challenges of Coal Transitions - A comparative study on the status quo and future prospects of coal mining and coal use in Indonesia, Colombia and Viet Nam*.

- Zahari, T. N., & McLellan, B. C. (2023). Review of Policies for Indonesia's Electricity Sector Transition and Qualitative Evaluation of Impacts and Influences Using a Conceptual Dynamic Model. *Energies*, 16(8), 3406. <https://doi.org/10.3390/en16083406>
- Zhu, M., Lou, J., Cui, R. Y., Cheng, X., Li, S., Li, D., Arinaldo, D., Li, W., & Hultman, N. (2023). *Decarbonizing Captive Coal Power Plants in Indonesia and Implications for Chinese Stakeholders: Trends, Challenges and Opportunities*.
- Zhu, Z., & Wijaya, A. (2023, February 6). *The future is green: unlocking Indonesia's renewable energy potential*. East Ventures. <https://east.vc/news/insights/the-future-is-green-unlocking-indonesias-renewable-energy-potential/>

APPENDICES

Appendix A. Survey and Interview Questions

Pengantar

Isu lingkungan khususnya Net Zero Emission telah menjadi isu global yang sudah semakin serius ditanggapi oleh pemerintah Indonesia. Aturan mengenai pelarangan pembangunan pembangkit baru dan rencana memensiunkan PLTU Batu Bara sudah menjadi program pemerintah khususnya untuk pembangkit listrik PLN (Perusahaan Listrik Negara).

Namun, bagaimana dengan PLTU Batu Bara khususnya captive power plant atau pembangkit untuk kepentingan sendiri seperti yang beroperasi di PT Kaltim Prima Coal?

PLTU PT KPC selain telah menyerap tenaga kerja baik karyawan maupun kontraktor untuk bekerja didalamnya, juga memiliki peran yang sangat penting dalam memenuhi kebutuhan listrik untuk operasional KPC, khususnya jika izin usaha pertambangan KPC diperpanjang setelah tahun 2031.

Nama (akan disamarkan saat penyajian hasil penelitian):

Pengalaman Bekerja (pilih salah satu):

Kurang dari 5 tahun 5 – 10 tahun Lebih dari 10 tahun

1. Menurut Anda apa saja tantangan yang akan dihadapi oleh PLTU Batu Bara PT. KPC di masa mendatang setelah tahun 2031?

2. Menurut Anda apa dampak bagi PLTU Batu Bara PT. KPC sehubungan dengan isu lingkungan global terkait Net Zero Emission atau Zero Carbon?

IDENTIFIKASI FAKTOR PENDORONG

Masa Depan Operasi PLTU Batu Bara PT KPC menuju *Net Zero Emission* setelah 2031

No.	Faktor Pendorong	Tingkat Dampak	Tingkat Ketidak Pastian
		1: Tidak berdampak 5: Sangat berdampak	1: Ketidakpastian rendah / mudah diprediksi 5: Ketidakpastian tinggi / sulit diprediksi
1	Tenaga kerja yang berkualifikasi.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
2	Aspirasi masyarakat dan pelanggan. Contoh: pandangan atau kepedulian masyarakat terhadap energi yang lebih bersih.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
3	Distribusi dan akses energi bagi masyarakat atau pelanggan. contoh: kemudahan akses untuk mendapatkan listrik	① ② ③ ④ ⑤	① ② ③ ④ ⑤
4	Peningkatan teknologi penyimpanan energi. contoh: industri baterai semakin maju dan murah.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
5	Teknologi Penangkapan, Pemanfaatan, dan Penyimpanan Karbon (Carbon Capture, Utilization and Storage).	① ② ③ ④ ⑤	① ② ③ ④ ⑤
6	Teknologi Hilirisasi (pemanfaatan / pengembangan) Batubara. contoh pemanfaatan: PLTU mulut tambang contoh pengembangan: dimetil eter, methanol, gasifikasi, briket	① ② ③ ④ ⑤	① ② ③ ④ ⑤
7	Tren Perubahan Iklim. Contoh: suhu global naik lebih cepat	① ② ③ ④ ⑤	① ② ③ ④ ⑤
8	Tren Polusi di Indonesia. contoh: kualitas udara di kota-kota industri Indonesia makin parah.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
9	Tren Penggunaan Energi Terbarukan di Indonesia. contoh: semakin banyak pembangunan PLT surya atau angin.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
10	Tantangan Pembiayaan/Pinjaman/Perbankan ("Green Financing") Contoh: regulasi untuk mendapatkan pembiayaan dari bank yang melibatkan parameter carbon credit.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
11	Tren Harga Batubara. contoh: harga batu bara semakin naik atau semakin turun atau fluktuatif.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
12	Permintaan Batubara Global/Internasional	① ② ③ ④ ⑤	① ② ③ ④ ⑤
13	Permintaan Batubara Lokal/Indonesia	① ② ③ ④ ⑤	① ② ③ ④ ⑤

14	Pertumbuhan PDB (GDP) Indonesia. contoh: pertumbuhan ekonomi terhadap kebutuhan energi.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
15	Trend permintaan penggunaan listrik. contoh: semakin banyak industri atau perumahan yang mengajukan instalasi listrik atau tambah daya.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
16	Cadangan Batubara Indonesia.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
17	Dinamika geopolitik. contoh: adanya perang Ukraina dan Rusia.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
18	Regulasi royalti penjualan batu bara. contoh: aturan royalti yang semakin menyulitkan atau semakin melonggarkan kedepan.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
19	Regulasi carbon tax & carbon credit. contoh: kemungkinan pengeluaran carbon tax dan carbon credit sudah mulai membebani keuangan perusahaan.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
20	Dinamika politik di Indonesia. contoh: kestabilan politik dalam negeri.	① ② ③ ④ ⑤	① ② ③ ④ ⑤
21	Regulasi pelarangan PLTU Batubara untuk Captive Power Plant. contoh: captive power plant juga akan dilarang untuk beroperasi dalam waktu dekat.	① ② ③ ④ ⑤	① ② ③ ④ ⑤

3. Apakah menurut anda ada Factor Pendorong lainnya?

22	...?...	① ② ③ ④ ⑤	① ② ③ ④ ⑤
23	...?...	① ② ③ ④ ⑤	① ② ③ ④ ⑤

4. Menurut Anda, strategi apa yang perlu dilakukan atau disiapkan oleh PLTU PT KPC untuk menghadapi tantangan Net Zero Emission jika tahun 2031 izin usaha KPC diperpanjang?

5. Menurut Anda, tanda-tanda apa saja yang perlu diperhatikan PT KPC dalam 10 tahun kedepan untuk menentukan apakah strategi di atas perlu dijalankan atau tidak?

Appendix B. Recapitulation of Driving Forces

IMPACT LEVEL																		
	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5	Respondent 6	Respondent 7	Respondent 8	Respondent 9	Respondent 10	Respondent 11	Respondent 12	Respondent 13	Respondent 14	Respondent 15	Respondent 16	Respondent 17	Respondent 18
Nama (akan disamarkan saat penyajian hasil penelitian)																		
1. Tenaga kerja yang berkualifikasi.	5	4	4	5	5	5	5	4	4	2	5	5	5	4	5	3	5	3
2. Aspirasi masyarakat dan pelanggan.Contoh: pandangan atau kepedulian r	2	4	4	3	2	5	5	3	4	2	4	2	3	3	3	1	3	4
3. Distribusi dan akses energi bagi masyarakat atau pelanggan.contoh: kemu	2	3	2	5	1	1	3	4	2	2	4	3	3	5	3	5	4	4
4. Peningkatan teknologi penyimpanan energi.contoh: industri baterai semal	1	4	4	5	2	1	5	4	3	2	5	4	1	3	4	4	5	4
5. Teknologi Penangkapan, Pemanfaatan, dan Penyimpanan Karbon (Carbon	2	4	4	5	5	1	5	3	4	2	4	4	5	3	4	4	3	4
6. Teknologi Hilirisasi (pemanfaatan / pengembangan) Batubara.contoh pen	3	4	4	5	4	5	3	3	4	2	4	4	5	3	4	4	4	2
7. Tren Perubahan Iklim.Contoh: suhu global naik lebih cepat	4	4	4	1	2	5	3	4	3	4	4	5	1	4	5	4	3	5
8. Tren Polusi di Indonesia.contoh: kualitas udara di kota-kota industri Indon	4	4	5	1	2	5	3	4	3	4	3	3	1	3	5	4	3	5
9. Tren Penggunaan Energi Terbarukan di Indonesia.contoh: semakin banyak	3	4	4	5	2	5	5	4	4	3	3	2	1	3	4	5	3	4
10. Tantangan Pembiayaan/Pinjaman/Perbankan ("Green Financing")Contoh	2	3	4	2	4	5	4	4	3	4	4	5	1	4	4	4	3	5
11. Tren Harga Batubara.contoh: harga batu bara semakin naik atau semakir	4	4	4	4	5	5	4	3	3	3	4	5	1	4	5	4	3	4
12. Permintaan Batubara Global/Internasional	2	4	4	5	5	5	5	3	2	4	4	5	1	5	5	4	4	3
13. Permintaan Batubara Lokal/Indonesia	4	4	4	5	5	5	5	4	2	3	4	5	1	4	5	4	4	3
14. Pertumbuhan PDB (GDP) Indonesia.contoh: pertumbuhan ekonomi terh	2	4	4	5	2	3	4	4	3	3	4	5	5	4	4	4	3	3
15. Trend permintaan penggunaan listrik.contoh: semakin banyak industri at	3	3	4	5	1	1	5	4	2	3	4	3	5	4	4	4	4	3
16. Cadangan Batubara Indonesia.	4	4	4	5	5	3	5	4	2	3	4	4	5	3	3	4	4	4
17. Dinamika geopolitik.contoh: adanya perang Ukraina dan Rusia.	2	3	4	5	5	1	4	3	3	4	4	4	5	5	4	4	2	2
18. Regulasi royalti penjualan batu bara.contoh: aturan royalti yang semakin	4	3	4	5	5	1	4	3	3	4	5	5	5	5	5	4	3	4
19. Regulasi carbon tax & carbon credit.contoh: kemungkinan pengeluaran c	5	4	4	5	5	4	3	4	3	4	5	5	5	5	3	5	4	3
20. Dinamika politik di Indonesia.contoh: kestabilan politik dalam negeri.	4	3	4	5	3	4	4	3	2	4	5	5	1	4	5	4	3	2
21. Regulasi pelarangan PLTU Batubara untuk Captive Power Plant.contoh: ca	5	3	4	1	5	5	4	4	3	5	4	4	5	4	5	4	5	3

UNCERTAINTY LEVEL																		
	Respondent 1	Respondent 2	Respondent 3	Respondent 4	Respondent 5	Respondent 6	Respondent 7	Respondent 8	Respondent 9	Respondent 10	Respondent 11	Respondent 12	Respondent 13	Respondent 14	Respondent 15	Respondent 16	Respondent 17	Respondent 18
Nama (akan disamarkan saat penyajian hasil penelitian)																		
1. Tenaga kerja yang berkualifikasi.	1	3	1	1	3	1	1	2	2	2	4	2	1	2	2	1	2	2
2. Aspirasi masyarakat dan pelanggan.Contoh: pandangan atau kepedulian r	2	4	4	4	3	1	3	3	3	2	3	3	1	2	3	2	2	2
3. Distribusi dan akses energi bagi masyarakat atau pelanggan.contoh: kemu	2	4	2	1	4	4	3	4	2	2	3	3	1	2	2	2	2	4
4. Peningkatan teknologi penyimpanan energi.contoh: industri baterai semal	5	4	4	1	2	2	1	2	3	2	4	1	5	2	3	5	4	2
5. Teknologi Penangkapan, Pemanfaatan, dan Penyimpanan Karbon (Carbon	5	4	2	1	2	5	3	2	3	2	4	1	5	3	5	2	2	4
6. Teknologi Hilirisasi (pemanfaatan / pengembangan) Batubara.contoh pen	3	4	4	5	2	2	3	2	3	3	3	3	5	3	5	5	4	4
7. Tren Perubahan Iklim.Contoh: suhu global naik lebih cepat	2	4	1	5	4	1	3	2	4	4	4	1	3	3	1	4	3	2
8. Tren Polusi di Indonesia.contoh: kualitas udara di kota-kota industri Indon	2	4	1	5	2	1	3	2	4	2	3	1	1	3	1	4	3	2
9. Tren Penggunaan Energi Terbarukan di Indonesia.contoh: semakin banyak	4	4	3	2	4	1	1	2	4	2	4	1	2	3	3	2	3	2
10. Tantangan Pembiayaan/Pinjaman/Perbankan ("Green Financing")Contoh	4	3	3	4	5	1	2	2	3	2	4	1	5	3	3	2	2	2
11. Tren Harga Batubara.contoh: harga batu bara semakin naik atau semakir	5	3	2	1	5	4	1	4	3	3	5	1	5	4	5	5	5	4
12. Permintaan Batubara Global/Internasional	3	4	3	1	5	5	1	4	3	5	4	1	5	4	4	5	4	2
13. Permintaan Batubara Lokal/Indonesia	3	4	3	1	5	5	3	2	3	4	4	1	3	3	4	2	4	2
14. Pertumbuhan PDB (GDP) Indonesia.contoh: pertumbuhan ekonomi terh	3	4	3	2	5	4	1	2	3	2	4	1	1	2	3	2	2	2
15. Trend permintaan penggunaan listrik.contoh: semakin banyak industri at	3	3	3	1	5	5	2	1	3	2	3	1	1	2	3	1	2	2
16. Cadangan Batubara Indonesia.	4	4	2	1	1	5	1	2	4	3	2	1	3	2	3	2	2	2
17. Dinamika geopolitik.contoh: adanya perang Ukraina dan Rusia.	4	3	3	1	5	5	1	4	2	4	4	1	5	5	5	5	5	4
18. Regulasi royalti penjualan batu bara.contoh: aturan royalti yang semakin	3	3	1	2	5	5	1	4	2	2	5	1	5	4	5	4	4	4
19. Regulasi carbon tax & carbon credit.contoh: kemungkinan pengeluaran c	3	3	1	5	5	2	3	4	2	2	5	1	5	4	5	4	4	2
20. Dinamika politik di Indonesia.contoh: kestabilan politik dalam negeri.	4	4	3	2	5	2	1	4	2	2	5	1	5	5	5	5	4	4
21. Regulasi pelarangan PLTU Batubara untuk Captive Power Plant.contoh: ca	1	3	3	5	4	2	1	4	3	4	4	3	5	4	5	4	3	2

Appendix C. Recapitulation of Open-Ended Question

<p>1. Menurut Anda apa saja tantangan yang akan dihadapi oleh PLTU Batu Bara PT. KPC di masa mendatang setelah tahun 2031?</p>	<ol style="list-style-type: none"> 1. Perpanjangan kontrak PT KPC dan keteersediaan batubara. Selain itu issue zero carbon 2. Cadangan / batubara yg semakin berkurang, Biaya operasional & maintenance akan lebih besar. 3. Harga Batu Bara, Kenaikan Biaya Operasional, Kebijakan Pemerintah , Green Energy 4. coal power plant akan belum tergantikan krn elect source yg plg murah utk saat ini. Jika di 2031 teknologi baterai berkembang dan dpt menyimpan tegangan lebih besar, maka kemungkinan era PLTU akan berganti ke Renewable Energy. 5. Berkembangnya green energy 6. Akan tetap eksis jika mampu mengikuti perkembangan teknologi yang ada dan mencoba menggunakan bahan bakar mix dengan biomass 7. Peraturan dan ketegasan dari pemerintah terkait kewajiban implementasi green energi yg pastinya akan berdampak terhadap keberlangsungan PLTU yang dimiliki oleh PT KPC 8. Tantangan akan tuntutan NZE kepada PLTU yang menghasilkan karbon
<p>2. Menurut Anda apa dampak bagi PLTU Batu Bara PT. KPC sehubungan dengan isu lingkungan global terkait Net Zero Emission atau Zero Carbon?</p>	<p>pc akan lebih memperhatikan kondisi kualitas emisi udara.</p> <ol style="list-style-type: none"> 2. Saat ini pltu kpc mempersiapkan untuk zero carbon. 3. Kpc dituntut harus mengikuti peraturan pemerintah terkait dengan zero energi emisi dan zero carbon untuk operasionalnya, sehingga monitoring flue gas pembakaran boiler akan lebih diperketat lagi. 4. Berdampak pada kegiatan operasional dan perangkat pendukung terhadap zero carbon emission 5. PLTU akan berperan sebagai penghasil carbon. secara perusahaan, KPC bisa membuat balance defisit carbon dengan program2 lain terkait lingkungan. 6. Secara operasional tidak akan terpengaruh karena PLTU KPC milik swasta dan kebutuhannya jelas diperlukan oleh KPC, kecuali jika ada aturan pemerintah mengenai larangan PLTU Batubara, barulah pltu kpc akan terpengaruh. 7. Ini akan menjadi perhatian dan bisa saja disuntik mati apabila tidak menggunakan bahan bakar campuran biomassa 8. PLTU yg ada harus ditutup/Shutdown 9. KPC harus melakukan improvement untuk bisa meminimalisir carbon emisi dr PLTU yg ada saat ini yang pastinya akan memerlukan biaya. 10. Tentu akan berdampak karena nantinya semua PLTU harus mengurangi emisi karbonnya 11. PLTU Batu bara KPC telah mempertimbangkan aspek pengelolaan dan pemantauan sesuai dengan

	<p>Lampiran RKL-RPL.</p> <p>12. Pihak operasional dipastikan untuk menjalankan operasi PLTU sesuai dengan prosedur.</p> <p>13. Terkait dgn Net Zero Emission dan Zero Carbon, dapat memberikan kontribusi dalam mengurangi Karbon dan Emisi, dimana output power dan listrik dioptimasi untuk menggantikan penggunaan bahan bakar fosil</p> <p>14. Teknologi pengendalian emisi yang existing bisa jadi harus diupgrade jika baku mutu emisi diperketat.</p> <p>15. Meskipun jika dihitung serapan emisi carbon dari kegiatan reklamasi juga cukup banyak, jika dibandingkan emisi carbon yang direlease dari pengoperasian PLTU</p> <p>16. Harus segera direncanakan koversi energi ke ebt</p> <p>17. Kehilangan pelanggan dari negara maju yang mengutamakan lingkungan.</p> <p>18. Kehilangan beberapa fasilitas bisnis yang sebelumnya dapat dinikmati seiring mencuatnya isu lingkungan. Contohnya bank Jepang membatasi diri dalam transaksi terkait Batubara.</p> <p>19. Perlu di-zero-kan dengan program reklamasi, efisiensi dan peralihan bbm ke tenaga listrik</p> <p>20. PLTU Batubara harus beradaptasi untuk bisa menerapkan kebijakan yang di tetapkan pemerintah.</p> <p>21. PLTU Batubara harus menggunakan teknologi agar emisi gas buang tetap comply</p> <p>22. Perlu investasi dana untuk penerapan teknologi yang lebih modern dan peningkatan sumberdaya manusia untuk dapat memenuhi kebijakan NZE</p> <p>23. Jika PLTU Batubara KPC tidak comply maka ada tambahan biaya kompensasi yang harus di keluarkan dalam bentuk Carbon tax dan potensi ketidak patuhan yang bisa berdampak mengganggu operasional PT.KPC secara umum</p> <p>24. PLTU batubara PT. KPC cepat/lambat pasti akan terdampak untuk menyesuaikan dengan kebijakan pemerintah.</p> <p>25. Modifikasi pada PLTU mungkin akan diperlukan untuk pemenuhan standard emisi gas buang hasil pembakaran batubara, bahkan kondisi terburuknya adalah menghentikan operasi PLTU 2x5MW (PLTU teknologi lama) jika cost modifikasi terlalu besar.</p> <p>26. Pltu mengganti energi diesel untuk running plant shingga emisi bisa dipusatkan dan lbh mudh dikontrol. Bisa smakin besar lagi jika bisa difungsikan juga untuk mengganti fuel di mobile equipment.</p> <p>27. Regulatory Pressure: Governments worldwide are introducing stricter regulations to reduce carbon emissions. This includes carbon pricing, emissions trading systems, and direct regulations limiting the use of coal. PT. KPC may face increased regulatory scrutiny and potentially higher operational costs to comply with</p>
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	<p>these regulations.</p> <p>28. Market Dynamics: The demand for coal is likely to decrease as countries and companies shift towards renewable energy sources like wind, solar, and hydro. This can affect PT. KPC's market position and profitability as coal becomes a less attractive energy source.</p> <p>29. Investment Shifts: Investors are increasingly favoring companies with strong environmental, social, and governance (ESG) credentials. PT. KPC might find it harder to attract investment if it continues to rely heavily on coal without a clear transition plan towards cleaner energy sources.</p> <p>30. Technological Advancements: There is a growing emphasis on developing and adopting cleaner technologies, such as carbon capture and storage (CCS) and coal-to-gas conversion. PT. KPC may need to invest in these technologies to reduce its carbon footprint and align with global trends.</p> <p>31. Reputation and Social License: Public perception and social license to operate are critical for any company. PT. KPC could face reputational risks if it is seen as not contributing to the global effort to combat climate change. This could affect its relationships with stakeholders, including governments, local communities, and customers.</p> <p>32. Operational Changes: To align with Net Zero goals, PT. KPC might need to diversify its energy portfolio, potentially investing in renewable energy projects or transitioning to cleaner fuels. This would require significant changes in operations and strategy.</p> <p>33. Financial Implications: Compliance with new regulations, investment in cleaner technologies, and potential shifts in market demand can have substantial financial implications. PT. KPC may face increased costs in the short term but could benefit in the long term by positioning itself as a leader in sustainable energy.</p>
<p>8. Menurut Anda, strategi apa yang perlu dilakukan atau disiapkan oleh PLTU PT KPC untuk menghadapi tantangan Net Zero Emission jika tahun 2031 izin usaha KPC diperpanjang?</p>	<ol style="list-style-type: none"> 1. Sistem oxiana yg dapat dikendalikan secara otomatis 2. Operasional PLTU ramah lingkungan, pengelolaan emisi dan limbah dengan baik sesuai aturan. 3. PLTU bisa memberi kontribusi listrik bagi masyarakat Kutim. 4. Merencanakan dan mempersiapkan resource dan pembaharuan perangkat 5. sistem PLTU KPC perlu membuat project2 untuk membalance produksi carbon PLTU. 6. Secara perusahaan, KPC bisa melakukannya dgn menerapkan teknologi renewable energy dalam praktik operasional pertambangan. 7. Perbaikan/penggantian peralatan yang banyak yang tidak berfungsi normal. 8. Perbaikan implementasi operasional dan maintenance yang tidak terstruktur baik dengan baik.

	<p>9. Penyediaan sparepart sehingga tidak banyak alat yang rusak karena menunggu sparepart.</p> <p>10. Menggunakan campuran bahan bakar yang dapat diperbaharui dan teknologi yang ramah lingkungan dan modern</p> <p>11. Keep Improving sistem yang ada di PLTU KPC saat ini untuk mendapatkan carbon emisi sekecil mungkin untuk menutup celah someone/somebody blams KPC in the future</p> <p>12. Harus memastikan teknologi yang bisa mengurangi gas emisi karbon</p> <p>13. Manajemen operasional dan strategi penggunaan outflow listrik</p> <p>14. Upgrade instalasi pengendali emisi jika aturan baku mutu diperketat,</p> <p>15. penambahan sumber energi listrik lain, misal dari angin, air, dll jika PLTU distop atau hanya boleh dioperasikan sepersekian dari kapasitasnya</p> <p>16. Harus sudah mulai direncanakan penggunaan energi terbarukan non batubara</p> <p>17. Teknologi Carbon Capture Storage.</p> <p>18. Mempersiapkan complimentary emission supaya impas /net zero</p> <p>19. Terus terlibat aktif dalam perkembangan aturan NZE</p> <p>20. Melakukan modifikasi peralatan agar emisi pLTU tetap pada ambang batas yang di izinkan</p> <p>21. Melakukan verifikasi gas rumah kaca secara berkala</p> <p>22. Menyiapkan protocol operasional PLTU terbaru untuk mengakomodir tantangan NZE</p> <p>23. KPC untuk segera menerapkan road map NZE diberbagai aspek operasional KPC termasuk mulai persiapan Carbon Trading</p> <p>24. KPC untuk mulai mengurangi ketergantungan dari PLTU batubara</p> <p>25. bertahap beralih menggunakan EBT untuk keperluan listrik perusahaan</p> <p>26. KPC perlu melakukan study terhadap kebijakan net zero emission terkait arah kebijakan pemerintah &</p> <p>27. kemudian melakukan benchmarking untuk mendapatkan informasi terkait teknologi yang digunakan untuk menekan emisi carbon,</p> <p>28. perlu dukungan komitmen dari top management bila adopsi teknologi tersebut harus dilakukan untuk mengakomodir kebijakan dari pemerintah.</p> <p>29. Update teknologi emisi sesuai termutakhir</p> <p>30. Invest in Clean Technologies</p> <p>31. Carbon Capture and Storage (CCS): Invest in CCS technologies to capture and store carbon emissions from coal combustion. This can significantly reduce the plant's carbon footprint.</p> <p>32. Renewable Energy Integration: Begin integrating renewable energy sources like solar, wind, and hydro into the energy mix. This can be done through hybrid</p>
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	<p>systems or by setting up separate renewable energy projects.</p> <p>33. Operational Efficiency Improvements</p> <p>34. Energy Efficiency: Implement measures to improve the energy efficiency of existing operations. This includes upgrading equipment, optimizing processes, and adopting best practices in energy management.</p> <p>35. Regular Maintenance: Ensure regular and thorough maintenance of plant equipment to avoid inefficiencies and excessive emissions due to equipment wear and tear.</p> <p>36. Diversification of Energy Sources</p> <p>37. Transition to Cleaner Fuels: Explore the use of cleaner fuels such as natural gas as a transition fuel. This can help reduce emissions while renewable infrastructure is being developed.</p> <p>38. Hybrid Systems: Develop hybrid systems that combine coal with renewable energy sources to reduce overall emissions.</p> <p>39. Research and Development (R&D)</p> <p>40. Innovation in Clean Technologies: Invest in R&D to explore new and emerging technologies that can reduce emissions and improve sustainability.</p> <p>41. Partnerships with Research Institutions: Collaborate with universities and research institutions to stay at the forefront of technological advancements.</p> <p>42. Regulatory Compliance and Engagement</p> <p>43. Proactive Compliance: Stay ahead of regulatory changes by proactively complying with current and anticipated environmental regulations.</p> <p>44. Engagement with Policymakers: Engage with policymakers to stay informed about regulatory developments and to advocate for policies that support a gradual and feasible transition to net zero emissions.</p> <p>45. Financial Strategies</p> <p>46. Green Financing: Explore green financing options such as green bonds, climate bonds, and other sustainability-linked financial instruments to fund clean energy projects.</p> <p>47. Cost Management: Implement cost management strategies to ensure that investments in clean technologies and efficiency improvements are financially sustainable.</p> <p>48. Stakeholder Engagement and Corporate Social Responsibility (CSR)</p> <p>49. Community Engagement: Engage with local communities to ensure that they are informed and supportive of the company's sustainability initiatives.</p> <p>50. Transparency and Reporting: Maintain transparency in reporting environmental performance and sustainability initiatives. This can build trust and improve the company's reputation.</p> <p>51. Workforce Training and Development</p>
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	<p>52. Skill Development: Invest in training programs to equip the workforce with the skills needed to operate and maintain new technologies and renewable energy systems.</p> <p>53. Safety and Compliance Training: Ensure that employees are well-trained in safety protocols and compliance with environmental regulations.</p> <p>54. Long-term Strategic Planning</p> <p>55. Roadmap to Net Zero: Develop a clear and actionable roadmap to achieve net zero emissions by a specific target date. This roadmap should include short-term, medium-term, and long-term goals.</p> <p>56. Scenario Planning: Conduct scenario planning to anticipate future challenges and opportunities related to the transition to net zero emissions.</p> <p>57. Adoption of Digital Technologies</p> <p>58. Digital Monitoring and Analytics: Use digital technologies such as IoT, AI, and big data analytics to monitor emissions, optimize operations, and predict maintenance needs.</p> <p>59. Smart Grid Technology: Implement smart grid technologies to improve the efficiency and reliability of energy distribution.</p>
<p>9. Menurut Anda, tanda-tanda apa saja yang perlu diperhatikan PT KPC dalam 10 tahun kedepan untuk menentukan apakah strategi di atas perlu dijalankan atau tidak?</p>	<ol style="list-style-type: none"> 1. Perpanjangan kontrak KPC 2031 2. Harga batubara semakin turun 3. Seringnya pemantauan dari dinas lingkungan 4. Seringnya kunjungan dari PLN " 5. Perubahan Ekonomi dan iklim Global 6. Electrification technology dan autonomous technology. 7. Aturan dari pemerintah 8. Perubahan politik setelah 2024 mendatang mengingat para elit juga banyak yang memiliki usaha pertambangan batu bara saat ini. 9. Kebijakan pemerintah dan issue global 10. Regulasi, 11. tren market energy (bukan hanya batubara saja) 12. Kepastian bisnis 13. Peningkatan komitmen pemerintah dalam net zero emission 14. keluarnya peratuean peraturan baru mengenai PLTu batubara" 15. Perkembangan regulasi 16. Dinamika world wide dalam hal program NZE dan climate change 17. Kebijakan pemerintah dalam penerapan regulasi 18. Proyeksi kebutuhan batubara dunia untuk keberlanjutan usaha 19. Kampanye dunia mengenai net zero emission dan kebijakan pemerintah yang sedang dibuat terkait penggunaan energi fosil. 20. Kepastian aturan pemerintah, tren EBT. 21. New Environmental Regulations: Monitor for new or

	<p>stricter environmental regulations and policies at both the national and international levels. This includes carbon pricing, emissions trading schemes, and specific mandates on coal usage.</p> <p>22. Government Incentives: Look for government incentives for renewable energy projects, energy efficiency improvements, and carbon capture technologies.</p> <p>23. Coal Demand Trends: Pay attention to global and regional trends in coal demand. A significant decline in demand could signal the need to diversify energy sources.</p> <p>24. Energy Prices: Track the prices of coal, natural gas, and renewable energy sources. Competitive pricing of renewables could drive the transition away from coal.</p> <p>25. Emerging Clean Technologies: Keep an eye on advancements in clean energy technologies, including carbon capture and storage (CCS), renewable energy, and energy storage solutions.</p> <p>26. Adoption Rates: Observe the adoption rates of these technologies within the industry. High adoption rates by competitors may indicate a need to invest in similar technologies.</p> <p>27. ESG Investment Trends: Monitor trends in environmental, social, and governance (ESG) investing. Increasing pressure from investors for sustainable practices can necessitate the implementation of net zero strategies.</p> <p>28. Green Financing Availability: Look for the availability and terms of green financing options, such as green bonds and sustainability-linked loans.</p> <p>29. Community Feedback: Gauge local community sentiment and feedback regarding environmental impact and sustainability efforts. Negative sentiment could push for more aggressive sustainability measures.</p> <p>30. NGO and Activist Actions: Pay attention to actions and campaigns by environmental NGOs and activists. Increased activism can influence public perception and regulatory actions.</p> <p>31. Climate Change Impacts: Monitor the direct impacts of climate change, such as extreme weather events, which could affect plant operations and highlight the urgency of reducing emissions.</p> <p>32. Environmental Performance Metrics: Track the plant's environmental performance metrics, including emissions levels, energy efficiency, and resource use.</p> <p>33. Industry Benchmarks: Observe the actions and strategies of industry peers and competitors. If they are making significant strides towards net zero emissions, it may indicate a competitive necessity to follow suit.</p> <p>34. Collaborative Initiatives: Look for industry-wide collaborative initiatives aimed at sustainability.</p>
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	<p>Participation in these initiatives can provide insights and drive collective progress.</p> <p>35. Cost Reductions: Watch for reductions in the costs of clean technologies and renewable energy. As these technologies become more cost-effective, their implementation becomes more feasible.</p> <p>36. Technological Maturity: Assess the maturity and reliability of new technologies. Proven and reliable technologies are more likely to be successfully implemented.</p> <p>37. Corporate Sustainability Goals: Align with the company's long-term sustainability goals and commitments. Regularly review these goals to ensure they remain relevant and ambitious.</p> <p>38. Global Net Zero Commitments: Track global commitments to net zero emissions from countries, organizations, and industries. These commitments can influence regulatory and market conditions.</p> <p>39. Economic Indicators: Monitor economic indicators that could affect the feasibility of large-scale investments in clean technologies, such as economic growth, inflation rates, and energy market stability.</p> <p>40. Political Climate: Pay attention to the political climate and stability, as political support is crucial for the successful implementation of long-term sustainability strategies."</p> <p>41. Scrutiny of Coal's Environmental Impact</p> <p>42. Shift Towards Nuclear and Solar Energy</p> <p>43. Pressure to Maintain Electricity Prices</p> <p>44. Diversification from Coal in Industries</p> <p>45. Declining Domestic Coal Demand</p> <p>46. Export Market Opportunities</p> <p>47. Global Push Towards Green Energy</p> <p>48. Need for Reduced Emissions</p> <p>49. Transition from Coal</p> <p>50. Banking and Financing Challenges</p> <p>51. Rapid Technological Advancements</p> <p>52. Need for Digitalization</p> <p>53. Continuous Learning and Adaptation</p> <p>54. HBA vs International Prices</p> <p>55. Changes in HBA Price Formula</p> <p>56. Market Demand Fluctuations</p> <p>57. Changes in HBA Formula</p> <p>58. Government Subsidy Reimbursement</p> <p>59. Coal Downstream Ambitions</p> <p>60. Diversification into Non-coal</p> <p>61. Conversion of Coal to Ammonia</p> <p>62. Non-coal Diversification Timeline</p> <p>63. Shift towards Renewable Energy</p> <p>64. Coal's Diminishing Dominance</p> <p>65. Adoption of Green Mining Standards</p> <p>66. Emergence of Carbon Trading</p> <p>67. Rise of Hydrogen Energy</p>
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	<p>68. Solar Energy Potential 69. Nickel's Role in Energy Transition 70. Regulatory Focus on Reclamation 71. Increased Government Oversight 72. Zero Emission Targets</p>
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Appendix D. Video Recorded Interview Transcription

Interview with “AM”, CEO PT Kaltim Prima Coal (KPC)

Youtube Channel: Indoindians

Poonam Sagar: Hello everyone, welcome. I am Poonam Sagar at Indonesia India business forum and today we are going to start with a very first interview with our esteemed guest Mr. “AM”. But before we start, I'd like to give a very short introduction to the Indonesia India business Forum which has been set up to enhance the interaction between the Indonesian and Indian business community so that new business opportunities can be explored, initiated, and actioned. IIBF hosts prominent Indonesian and Indian thought leaders, Business Leaders, and also business networking events.

Poonam Sagar: Today we are very pleased to have one of the top 10 CEOs in mining as recognized by CEO insights Asia, Mr. “AM”. He's the CEO of PT Kaltima Coal KPC.

“AM”: Hi Mr. “AM”, how are you doing?

“AM”: Fine, I'm doing okay. What about you?

Poonam Sagar: I'm fine, thank you. Thank you very much. I'm very happy you took this time out to talk to us. I'd just like to introduce that KPC is one of Indonesia's largest producer and exporter of coal based in Sangata, East Kalimantan in Indonesia. It's the world's largest open pit mining sites with a production capacity of over 70 million tons per year. Congratulations “AM” again on this recognition and acknowledgment of your leadership.

“AM”: Thank you.

Poonam Sagar: What do you believe are the key attributes or strategies that have contributed to your success and this prestigious recognition?

“AM”: We are very frank with you, I was quite surprised when I was recognized because I never thought that I would come to this extent or be recognized as one of the top 10 leaders in the mining industry. Believe it or not, I am not a mining engineer. A lot of people ask me, "What is your basic qualification?" I said I'm not, I'm just an accountant and a company secretary from India. And when I got the opportunity to move to Indonesia from Tata Power, they actually surrounded me to head as the CFO of APC. Then Tata Power bought a 30 percent stake in KPC and another miner with me at that time. That was in 2007 and my wife also moved with me in 2008. Since then, I was new to the mining industry. I was earlier with power in the group, I had been with telecom and electronics. So this was the fourth industry in the group which really helped me to move ahead. And nothing much I've achieved, but it was this industry which helped me to move in my career. And the first thing I thought of myself was that I have to work with so many people around the world. I've never been outside India ever before that. I have not worked, I have traveled abroad but I have not worked before in any country other than India. And we had a lot of Australians, South Africans, Indonesians of course whom I had to work with. We had gradually the holding company Bakri Group sold to a Chinese partner also, China Investment Corporation. So I started working with CIC and at that time, one thing which I tell people is that when you are working abroad, you have to have a broad mind and you cannot think, "Okay, whatever I think that's the best." You have to keep your ideas, your mind open to other ideas, other suggestions, and maintain a good relationship with everybody from top to down. Because you are in a foreign country, unless you have the support of all, from operator down to the top, you cannot. So that was one mantra I really learned. That once I now own, once I get into a foreign country, I have to get close to the people, whether it is an operator, mechanic, or the compost. And that really helped me. So when I was elevated to the post of CEO, I had to start negotiating with the union and all these union people, I knew them. So it was not easy. We had almost six unions with five thousand people. So they knew me, I knew them. So they, it was a new experience dealing with the Indians and it was a very smooth union settlement ahead. So unlike India, India I had a terrible time. In Nelco, when we were there,

there was the Mumbai, he came from three different schools. I see people, they're tough. So I was the chief finance at that time and I had to go with the director to his house early in the morning to see how we can settle. But unlike my other experience, I had, it was very smooth. So my recommendation and one of the things why I was able to meet the aspirations of the shareholders, we have king shareholders now, we have four. That basically, I'm open to all. I keep my doors open, everybody, anybody can walk in. I don't believe in having a closed door and just sit inside. Somebody will knock or go to my secretary to take my appointment. I don't believe that.

Poonam Sagar: Right. So you're very right about being working abroad, having a broad mind, taking everybody together. So you're in fact the engine driving forward the entire KPC. You mentioned that you had not worked in coal earlier. So what is your, briefly if you could share with us your professional background from India and the coal industry?

"AM": This is my sixth industry. In fact, I started with the tire industry and moved to consumer products and liquor companies. So all this, I see electronics, telecom. Electronics was in the Tata group, telecom, and then power. Power was a difficult one because I was in strategy and business development. Couldn't understand much about power but compared to power, coal is much, much easier. But let me tell you one of the things which really has helped me to gain knowledge. I really thank Mackenzie for that. I think we had brought in Mackenzie to do operation improvement in KPC 2012. And I told them, "You are a consultant, you work worldwide. I need to learn from you." From seven in the evening to eight in the evening, one hour, I used to sit with them to understand. I see that's how, again, I don't have much knowledge like other mining engineers, but some, yes, I do have some knowledge. What questions to ask, what those pointers I can.

Poonam Sagar: Absolutely. And asking the right questions, I think is a great skill to have. And I can see that you've learned a lot with your consultants.

“AM”: Yeah.

Poonam Sagar: What has been your experience working in Indonesia?

“AM”: See, Indonesians are great. People are extremely cordial, very nice, very straightforward. And it has been a wonderful experience working with them. Whether I was with the group chairman yesterday, he was open to so many issues. *“AM”*, can you help in this, that, and all?" And that kind of welcoming to a max, that is not that I have seen elsewhere in the group.

Poonam Sagar: Yeah. *“AM”*, can you share any specific challenges or obstacles you have faced as CEO and what you've done to overcome them?

“AM”: Yeah. Then if you ask, today when I took over, there was COVID. So we had an outbreak of COVID in our mine site. We lost about 43 people died during the course. It was a bad time and looking after the family, because people, the families have lost their life. So some earning member has passed away. So it was heartbreaking for a lot of people had faced at that time. And gradually we hope, commit, we saw that the families were taken care of by KBC. So this was the first challenge I faced immediately upon taking the parts. Today, if you look at, we are facing challenges of not the business operation as such. The government regulations which have come and how we will get over it, how we move ahead, how to reduce costs has become a major, major challenge for all of us in the mining industry. Basically, those large companies who are operating in Indonesia.

Poonam Sagar: I see. So costs have become a large thing. And I hear you, you know, during the pandemic, everybody went through a huge change. It was an incredibly challenging time. And for you or your company to suffer such a loss, really heartbreaking. *“AM”*, what role do you see KPC playing in the larger energy landscape of Indonesia? And you know, what does, how do you envision the company's future growth and contribution to the nation's economy?

“AM”: Let me tell you, you know, the other highest taxpayer as well as the highest non-tax revenue period in the country, so far as the mining industries I see. So we will, that is so far as the full industry is concerned. But people, today if you go to a bank, you ask for funds, "Hey, you are a coal leader company, we don't want to give." If you go to a rating agency, you are already down by 50 percent. So out of 50, they will give you, okay, 40 upon 50. That's the best score you can get. But it's not an industry which people will look forward to for the career in the future. That is my thinking. So what as KPC we are doing, we are getting into downstream projects. So APC will invest in coal classification, it's called to synthetic gas. We will produce ammonia out of it. So the project we will start next year, 24 groundbreaking it will be. And we hope to complete by mid-2026. So that will be the first step to move away from coal into a coal downstream project. So that we are not recognized as a coal industry per se. And we have to do something more than mining. The second industry which we are looking at is aluminum. So we will, this project, the first project will come up in Bangalore, one of our mine sites. The second project, aluminum, is looking at setting up in...

Poonam Sagar: Because coal will continue to be the source of fuel for the next 10 years, 10 to 15 years in my opinion. But gradually, if KPC's name has to be there. Right. In fact, you know, I was going to ask you, why coal? And why, you know, when the push in the light of the global push towards having green renewable. But you've already answered that. But apart from that, how do you prioritize environmental sustainability and social responsibility within KPC's operations?

“AM”: I think so far as social responsibility is concerned, we have started looking at how to reduce the ambition over a period of time. We have been doing in the past, but now we have slowly looking into, can we expedite that? We are no more burning emission and we gradually move towards sustainability in the future. Because that's the keyword today. So we are, besides bonfire power plant, we have started looking at solar and biomass.

Poonam Sagar: I see. Oh, well, these are all very important steps to getting to having a greener environment. And it's becoming more of a need rather than just a buzzword.

“AM”: Yeah, it says voter for need and you cannot shy away from it. You have to accept this one day or the other. You go to the banks, insurance companies, if you are only a whole company.

Poonam Sagar: Correct. “AM”, what do you do to maintain a healthy work-life balance being so busy as a CEO? And what strategies do you employ to prevent burnout and maintain your own well-being?

“AM”: To be very frank with you, I used to work almost 13 to 15 hours. I'm here now. I have started reducing and I have made people understand that it is not an individual who can drive the company. We have to work on together. So it's HR which has to play a key role in all these aspects of getting the people, making it a fun place where people will be happy to work. It is not just, "I come to work" or "I had to work because I have to earn." It's not. Our main goal is to make it a fun place, a place where people will tell his or her friends, "It's the best employer." That's the ultimate goal I want to have.

Poonam Sagar: Yeah, sounds like an ideal place to live, to work in, where you tell your friends and family that, "I enjoy working here. I have fun here." It is not merely a place to earn likelihood. I think that's the dream of all companies.

“AM”: Yeah.

Poonam Sagar: I showed the last question. What advice would you give to aspiring leaders who wish to achieve similar success in their careers?

“AM”: See, one thing I tell the younger generation is that there is no ultimate to hard work. You may encounter failures, but through failure will come out to be a

successful leader. So there is nothing, nobody can replace hard work. But going forward, the younger generation will have to see that the world is changing fast. You have to adapt yourself to the changes also as fast as the world is changing. If you look at AI, today is the buzzword from the techies. If you are still living in a, "No, no, I am a technical guy. I don't know. I don't want to learn anything about AI," you are going to have a bad time moving ahead. So people will have to look at the new technologies like AI, digitalization. Your entire operations in the future, you cannot afford to rely on just working and you, there's nothing you can do.

Poonam Sagar: Right. And also to the younger generation, then we have to read a lot. I have started at my age learning about green hydrogen, learning green hydrogen. And sometimes the wife says, "Why are you sitting here after then?" I said, "Let me just concentrate on something new in this today's world."

Poonam Sagar: Right. No, I think that's a big lesson that we all need to incorporate, to keep learning. And you know, it's lifelong learning. And I appreciate your sharing your insights and your lessons with us about taking the whole company, having a broad mind, taking everybody together, as well as being aware of what are the new technologies in place like you mentioned AI and what is the digital transformation that's happening in all industries and making the workplace a fun place to be in. So I can see why you have been awarded the top 10 CEOs. So thank you, "AM". Thank you for your time. I appreciate this time with you.

"AM": Thank you very much.

Appendix E. Focus Group Discussion Documentation

Screenshot of Zoom Meeting

2024-07-11 21.19.12 FGD Scenario Planning_Captive Power Plant PT KPC

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4
	High price & High Regulation	Low price & Low Regulation	High price & Low Regulation	High price & High Regulation
Coal Price Trends	Double-Edged Sword High price > \$100 per ton	Silver Lining Low price < \$50 per ton	Perfect Storm Low price < \$50 per ton	Goal High price > \$100 per ton
Regulatory Changes	Introduction of stricter emission standards	Repeal or relaxation of existing regulations	Introduction of stricter emission standards	Repeal of existing regulations
Technological Development	Rapid adoption of new emissions technologies	Slow adoption of new technologies due to flexible regulations	Rapid adoption due to regulatory pressure despite financial strain	Moderate adoption focusing on existing technologies
Renewable Energy Development Achievements	Slow progress, <10% increase in renewable energy capacity	Moderate progress, 10-20% increase in renewable energy capacity	Minimal progress, <5% increase in renewable energy capacity	Rapid progress, >10% increase in renewable energy capacity
Coal Power Plant Closures	<5% of coal-fired power	5-10% of coal-fired power	<5% of coal-fired power	>10% of coal-fired power

Task	PIC	2024				2025				2026				2027				
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Scenario Planning and Monitoring																		
Develop Initial Scenarios	Strategy and Planning Team																	
Establish Early Warning Signals	Strategy and Planning Team																	
Enhance Operational Efficiency and Productivity																		
Conduct Operational Efficiency Assessment	COO Manager, O&M Power Plant, Supt. Operation																	
Implement Process Automation	Manager Engineering Power Plant, Supt. Electrical Engineering																	
Workforce Training Initiatives	HR Manager Human Resource																	
Implement Energy Efficiency Measures	Supt. Maintenance, Engineer Operation																	
Monitor and Evaluate Efficiency Improvements	Supt. Operation, Senior Engineer Operation																	
Continuous Learning and Digital Transformation																		
Develop Digital Transformation Roadmap	IT & Innovation, Manager Business Analyst																	

Koleksi digital milik UPT Perpustakaan ITB untuk keperluan pendidikan dan penelitian