CHAPTER I

INTRODUCTION

1.1. Background

Fossil fuels, particularly oil, have played a pivotal role in driving industrialization and global trade. Petroleum has been supporting the industrial revolution since the late 19th century. It serves as the backbone of Saudi Arabia's economy, which is recognized as one of the world's largest oil producers. Saudi Arabia controls some of the largest oil reserves globally, with Saudi Aramco as the state-owned oil company playing a crucial role in oil exploration, production, and export.[1]

The increasing energy consumption driven by economic growth, population expansion, and industrialization has led to a rising demand for energy to support development and economic progress.[2] While the use of fossil fuels can stimulate economic growth, it also significantly impacts on the environment. Forlastance, the effect create greenhouse gas emissions which contributing to higher risk of climate change. Additionally, the combustion of oil and coal produces harmful pollutants like sulfur dioxide, nitrogen oxides, and fine particles, leading to air pollution and public health

[1] Saphira Anindhita Putri Pratama Zalwa Apriliana Sesa, Baginda Goldy Hamonangan, Najla Ramadhanthi Yuristiannisa, "Perbandingan Pemanfaatan Industri Migas Oleh Perusahaan Minyak Dan Gas Nasional Petrobras Dan Sinopec," *MADANI Jurnal Politik Dan Sosial Kemasyarakatan* 13, no. 2 (2021): 134–48.
[2] Tania Stivani Pangestu and Edy Soesanto, "Sektor Migas Di Perusahaan Pertamina," *Jurnal Mahasiswa Kreatif* 1, no. 4 (2023): 25–38.

issues.[3] Oil spills during the refining process also pose a significant threat to marine ecosystems, causing extensive damage to marine life and coastal environment.[4]

The revenue generated from petroleum has enabled Saudi Arabia to play a significant role in the global economy. As a key member of the Organization of the Petroleum Exporting Countries (OPEC), Saudi Arabia contributes to oil policies among member countries to ensure global market stability and secure stable revenues for oil producers. Through OPEC, Saudi Arabia exerts significant influence on global oil prices, impacting the global economy.[5]

One of oil companies like Saudi Aramco, it originates from the formation of the Arabian American Oil Company (Aramco) in 1933 by five American oil companies: Chevron Corporation, Exxon Corporation, Mobil Corporation, Texaco, and the Standard Oil Company of California (SOCAL). These companies collaborated to establish Aramco to conduct exploration, exploitation, refining, and transportation of oil in Saudi Arabia. [6] Aramco's operations were conducted in the Ghawar oil field, one of the world's largest oil resources. The Saudi government later nationalized Aramco, taking full control of its operations. Despite the nationalization, Saudi Arabia maintained good relations with American oil companies, providing compensation for their assets.[7]

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[3] Dikta Muhammad Ferro Berlianto and Riko Setya Wijaya, "Pengaruh Transisi Konsumsi Energi Fosil Menuju Energi Baru Terbarukan Terhadap Produk Domestik Bruto Di Indonesia," *E-Jurnal Perspektif Ekonomi Dan Pembangunan Daerah* 11, no. 2 (2022): 105–12, https://doi.org/10.22437/pdpd.v11i2.17944.
[4] R Desrina, "Pemanasan Global Akibat Kegiatan Di Sektor Minyak Dan Gas Bumi," *Lembaran Publikasi Minyak Dan Gas Bumi* 48, no. 2 (2014): 63–72, https://doi.org/10.29017/lpmgb.48.2.1213.
[5] Jashim Uddin Ahmed, Hafiza Sultana, and Md Muinuddin Khan, "Saudi Aramco: A Blend between Profit and Politics," *FIIB Business Review* 7, no. 2 (2018): 88–99, https://doi.org/10.1177/2319714518785324.
[6] Eckart Woertz, "Aramco Goes Public: The Saudi Diversification Conundrum," *German Institute of Global and Area Studies (GIGA) Aramco*, 2019, 0–11, http://www.jstor.com/stable/resrep21206.
[7] Jean-Francois Seznec, "A SHORT SUMMARY OF SAUDI ENERGY RESOURCES AND POLICY," 2016.

The Saudi government launched a program to collect associated gas from oil and its valuable by-products.[8] The goal of this program was to protect the environment by eliminating gas flaring and preserving valuable gas resources for industrial purposes.[9] This initiative, known as the Master Gas System (MGS), includes a collection system, processing plants, fractionation plants, storage facilities, transmission pipelines, and export terminals. [10] Following the launch of the Master Gas System, aimed at collecting and utilizing associated gas, Saudi Aramco began exploring and developing non-associated gas reserves unrelated to oil production. This development enabled Saudi Aramco to process the gas into Liquefied Natural Gas (LNG).[11]

Although Saudi Aramco excels as the largest oil supplier globally, it lacks experience in developing LNG projects. Thus, the company needs to seek qualified partners to assist in LNG project development through investment and collaboration to achieve mutual goals. Saudi Aramco faces several technical and commercial challenges, including identifying strategic locations for international market activities and ensuring infrastructure security and technology to position LNG in the global arena.

The urgency of this research lies in understanding and developing effective collaborative strategies for LNG project development by Saudi Aramco to meet the needs of a sustainable energy economy. The use of LNG, representing a transition from non-

[8] Khalid A. Al-Falih, "Saudi Arabia's Gas Sector: Its Role and Growth Opportunities," *Oil and Gas Journal* 102, no. 23 (2004): 18–24.
[9] Mahmoud A Younis, "Master Gas System (MGS) – a Leap towards Zero Emission" 10, no. 3 (2022): 21–23.
[10] Mahmoud A Younis, "MASTER GAS SYSTEM PHASE 2 PRE-COMMISSIONING JOURNEY" 10, no. 3 (2022): 33–37.
[11] Gianmaria Pio and Ernesto Salzano, "Flammability Parameters of Liquified Natural Gas," *Journal of Loss Prevention in the Process Industries* 56, no. June (2018): 424–29, https://doi.org/10.1016/j.jlp.2018.10.002.

renewable to sustainable and environmentally friendly energy sources, can reduce carbon emissions and air pollution in power generation and industrial sectors.[12] This aligns with Islamic principles, emphasizing humans' duty to manage the environment responsibly to meet human needs without causing destruction. Surah Al-A'raf verse 56, interpreted by the scholar Ibn Kathir, highlights the prohibition against actions that harm the Earth's preservation and stability.[13]

Thus, in this study, the author analyze the collaboration undertaken by Saudi Aramco to achieve environmentally friendly energy economy goal. Saudi Aramco continues to enhance its technology and production capabilities through LNG processing by collaborating with technology and energy companies from other countries. [14] International cooperation enables Saudi Aramco to adopt advanced technologies and improve efficiency in implementing sustainable energy through LNG projects.

1.2.Formulation of the Problem

How are the cooperation in the development of Liquefied Natural Gas (LNG) project of Saudi Aramco companies to realize a sustainable energy economy?

1.3.Object of Research

This study aims to analyze the cooperation in the development of Liquefied Natural Gas (LNG) project of Saudi Aramco companies to realize a sustainable energy economy.

[12] Yunus A. Çengel, "Power Generation Potential of Liquified Natural Gas Regasification Terminals," *International Journal of Energy Research* 44, no. 4 (2020): 3241–52, https://doi.org/10.1002/er.5116.
[13] Ibnu Katsir, *Tafsir Ibnu Katsir*, 1st ed. (Pustaka Imam Syafi'i, 2015).
[14] Ayhan Demirbas, Hemaid Alsulami, and Abdul Sattar Nizami, "The Natural Gas Potential of Saudi Arabia," *Energy Sources, Part A: Recovery, Utilization and Environmental Effects* 38, no. 18 (2016): 2635–42, https://doi.org/10.1080/15567036.2015.1070218.

1.4.Benefits of Research

1.4.1. Academic Benefits

This research is expected to serve as a reference and provide new insights for the author, while also addressing the gaps related to Saudi Aramco's cooperation in achieving a sustainable energy economy.

1.4.2. Practical Benefits

Through this research, the author aims to analyze additional insights at the Saudi Arabian government regarding the development of Liquefied Natural Gas (LNG) projects to enhance domestic revenue and strategies to achieve sustainable energy through partnerships with various countries. This study is also intended to provide knowledge and understanding to the Indonesian government and society about the strategies implemented by Saudi Aramco in fostering a sustainable and environmentally friendly energy economy.

1.5.Literature Review

1.5.1. Previous Research

The first discussion concerns on Saudi Arabia's policy on importing LNG to meet domestic needs. Through the study conducted by Rami Shabaneh and Maxime Schenckery titled **"Assessing Energy Policy Instruments: LNG Imports into Saudi Arabia"**, it is explained that Saudi Arabia utilized LNG to support a more efficient and economical energy mix transition from oil dependency compared to relying solely on liquid fuels. The use of LNG for power generation also helps Saudi Arabia achieve environmental and air quality targets.[15] While the previous study focused on LNG imports for domestic consumption, this research will explore a broader perspective, encompassing

[15] Rami Shabaneh and Maxime Schenckery, "Assessing Energy Policy Instruments: LNG Imports into Saudi Arabia," *Energy Policy* 137, no. November 2019 (2020): 111101, https://doi.org/10.1016/j.enpol.2019.111101.

both import and export collaboration to meet global energy demands through LNG project development.

The second discussion highlights the role of natural gas in Saudi Arabia to fulfill energy needs and achieve significant economic growth. In the study by Ayhan Demirbas, Hemaid Alsulmi, and Abdul-Sattar Nizami (2016) by titled **"The Natural Gas Potential of Saudi Arabia"** it is noted that importing LNG can push companies towards more robust market-based energy pricing within the electricity supply mix. Several LNG facilities, such as Jum'aymah and Yanbu plants, are set for operational expansion, where LNG pipelines connect two major centers between the Arabian Gulf and the Red Sea. These initiatives are supported by the government in promoting sustainable energy efficiency projects in industrial, transportation, and residential sectors.[16] While the study highlights Saudi Arabia's potential in using natural gas for a sustainable energy economy, this research will focus on LNG as a sustainable energy alternative.

The third discussion addresses the technologies employed in LNG processing. The study titled **"The Future Role of Natural Gas in Saudi Arabia"** by Mohamed Morsy Elgohary and Captain Khalil Hemida introduces the launch of Floating Liquefied Natural Gas (FLNG) technology capable of producing, storing, and transferring LNG. FLNG technology operates offshore, allowing the production, liquefaction, storage, and transfer of LNG directly at sea.[17] While previous studies emphasize the role of LNG in meeting global energy needs through technological innovation, they lack details on Saudi

[16] Demirbas, Alsulami, and Nizami, "The Natural Gas Potential of Saudi Arabia."
[17] M.Morsy Elgohary, "The Future Role of Natural Gas in Saudi Arabia," *International Journal of Multidisciplinary and Current Research* 3, no. 5 (2013): 1042–45, https://doi.org/10.14741/ijmcr/23213124/3.5.2015.22.

Aramco's collaborative efforts with other oil and gas companies in achieving these goals. This study will fill that gap by discussing Saudi Aramco's partnerships in LNG development.

The fourth discussion explores the use of LNG to reduce carbon emissions and establish environmentally friendly oil companies. In the study by Hussein Al-Yafei, Saleh Aseel, Murat Kucukvar, et al. (2021), titled **"A systematic Review for Sustainability of Global Liquified Natural Gas Industry: A 10-year Update"** it is revealed that LNG serves as a sustainable energy alternative that can significantly reduce greenhouse gas emissions over the past decade (2010–2020) in several LNG-utilizing countries.[18] While the study provides valuable insights into LNG's benefits in reducing carbon emissions, this research will analyze its role in collaboration between Saudi Aramco and companies like ADNOC to meet global energy needs.

The fifth discussion examines LNG transformation into renewable energy. In the study by Haoshui, Truls Gundersen, and Emre Gencer (2021), titled**"Optimal Liquefied Natural Gas (LNG) Cold Energy Utilization in Allam Cycle Power Plant with Carbon Capture and Storage"** the cold energy of LNG is used in Allam cycle power plants to reduce energy penalties in carbon capture or compression processes for recycled exhaust gas. [19] While previous research elaborates on cold energy utilization for carbon

[18] Hussein Al-Yafei et al., "A Systematic Review for Sustainability of Global Liquified Natural Gas Industry: A 10-Year Update," *Energy Strategy Reviews* 38, no. October 2020 (2021): 100768, https://doi.org/10.1016/j.esr.2021.100768.
[19] Haoshui Yu, Truls Gundersen, and Emre Gençer, "Optimal Liquified Natural Gas (LNG) Cold Energy Utilization in an Allam Cycle Power Plant with Carbon Capture and Storage," *Energy Conversion and Management* 228, no. October 2020 (2021): 113725, https://doi.org/10.1016/j.enconman.2020.113725.

capture, this study will further explore LNG's role in achieving a sustainable and eco-friendly energy economy.

The final discussion involves Ahmad Al-Douri, Abdulrahman S.A., and Margau (2022), in their study **"Greenhouse Gases Emissions in Liquified Natural Gas as a Marine Fuel: Life Cycle analysis and reduction potential"**. It emphasizes LNG's potential as a marine fuel and its innovative solutions, such as decarbonization in liquefaction processes, to reduce greenhouse gas emissions.[20] While the research thoroughly discusses LNG's application as marine fuel, this study will connect LNG development with international cooperation, particularly by Saudi Aramco, to achieve sustainable energy goals.

This research introduces the novelty discussion on Saudi Aramco's cooperation in LNG development. Using a qualitative method with study case approach and analyzing relevant documents, reports, and articles, this study aims to examine Saudi Aramco's partnerships with other oil and gas companies, such as ADNOC (Abu Dhabi), SINOPEC (China), and PTT (Thailand), in fostering a sustainable energy economy through LNG projects.

1.6. Conceptual Framework

1.6.1. International Cooperation

In this research, the author employs the concept of international cooperation as an instrument to address the research questions. International cooperation refers to

[20] Ahmad Al-Douri et al., "Greenhouse Gases Emissions in Liquified Natural Gas as a Marine Fuel: Life Cycle Analysis and Reduction Potential," *Canadian Journal of Chemical Engineering* 100, no. 6 (2022): 1178–86, https://doi.org/10.1002/cjce.24268.

interactions between states that are driven by each country's national interests. This collaboration encompasses a set of rules, principles, norms, and decision-making procedures that govern the operations of international regimes. No state can exist independently without establishing relationships and cooperation with other nations, as high economic and social interdependence necessitates collaboration to achieve economic progress and stability.

One manifestation of interdependence between countries is international cooperation involving various actors in international relations, such as states, organizations, governments, and individuals.[21] International cooperation brings together national interests from different countries to address needs that cannot be met domestically. The primary issue lies in determining how mutual benefits can align with unilateral and competitive interests. This principle is also applied to Saudi Aramco, which seeks partnerships with oil companies that possess technological expertise and strategies for developing LNG projects.

According to K.J. Holsti in his book *International Politics: A Framework for Analysis*, international cooperation is a process wherein interconnected states work together to find solutions to shared problems. This process involves approach by conducting negotiations and identifying technical factors to find solutions to meet the goals. Similarly, Charles Armor McClelland, in his book *Theory and International System*

[21] Era Riana, "Kerjasama Indonesia-Korea Selatan Dalam Mendukung Program One Village One Product (OVOP) Di Indonesia 2013-2015," *Jom FISIP* 3, no. 1 (2016): 1–6.

(1966), defines international cooperation as various forms of interaction between individuals or groups within a society through their respective states.[22]

Such cooperation can occur through governments or directly by individuals as citizens. One of the reasons countries are engaged to enhance economic prosperity by reducing production costs, which might otherwise burden the country due to limited resources. Saudi Aramco, as a state-owned enterprise contributing to Saudi Arabia's economic growth, collaborates with global oil companies to achieve shared goals and interests.

Holsti identifies cooperation can be conducted when: (1) two or more countries share common interests, values, and goals to promote mutually beneficial outcomes; (2) each country anticipates that the policies enacted by other states will help to achieve their respective goals and interests; (3) it involves formal or informal rules, including written agreements, to regulate interactions on the way to achieve common objectives; (4) agreements or treaties often address relevant issues such as trade, environmental protection, human rights, security, and technology. The goal of Saudi Aramco's cooperation in LNG development aligns with Holsti's first principle, wherein each participating country shares a common objective to achieve mutual benefits.[23]

The concept of international cooperation applied by national oil and gas companies, including Saudi Aramco and other renowned companies such as ADNOC (Abu Dhabi), SINOPEC (China), and PTT PCL (Thailand), involves routine interaction to establish

[22] Charles Armor McClelland, *Theory and the International System (Government in the Modern World Series* (Collier-Macmillan, 1966).
[23] K.J Holsti, *International Politics a Framework for Analysis* (New Jersey: Prentice-Hall, 1967).

efficient oil and gas operations while ensuring environmental sustainability. LNG project requires consistentcy in production, distribution, and the use of advanced technology to guarantee efficiency and sustainability. Through international cooperation, all parties involved in LNG projects obtain benefits from the cooperation. The imported nations gain access for cleaner and more stable energy resources, while at the same time the producing countries like Saudi Aramco expand their market to reach and increase revenue.

1.6.2. Green Industry

This research further employs the concept of green industry to discuss and analyze the implementation of LNG projects to achieve sustainable and more renewable energy productions. Green industry emphasizes the transformation of industrial systems to achieve sustainability through technological innovation, resource efficiency, and responsible environmental management. According to Nicholas A. Ashford and Ralph P. Hall, green industry involves adopting cleaner production methods and sustainable industrial practices that minimize pollution and energy consumption to ensure benefits.[24] Green industry focuses not only on mitigating environmental impacts but also on addressing social and economic dimensions to achieve inclusive and sustainable development.

Green industry is based on four key principles that support industrial transformation toward sustainability. First, technology innovation is central to green industry, where clean technologies are employed to replace industrial processes with high pollution levels. Mechanism of carbon capture and utilization low-emission production

[24] Nicholas A Ashford and Ralph P Hall, *Technology, Globalization, and Sustainable Development*, *Yale University Press*, vol. 24 (United States of America, 2011), https://doi.org/10.1016/j.jclepro.2011.11.001.

methods, and renewable energy sources like solar and wind power, enable carbon footprint reduction while improving energy efficiency across various industrial sectors. Second, resource efficiency emphasizes optimizing raw material usage in a sustainable manner. Industries are encouraged to minimize waste, recycle materials, and reduce ecological pressures. Thus, it is also lowering operational costs and the risk of environmental harm at the same time.

Third, green industry aims to integrate economic growth with environmental preservation. Implementations on supporting policies such as tax incentives for green technology, carbon trading mechanisms, and strict regulations on pollution. Calls for, social justice and community empowerment form an integral part of the transition toward green industry. The dimension involves creating decent job opportunities and empower meet on communities to ensure benefits of industrial development are equitably distributed among all stakeholders.

Saudi Aramco's LNG development project can be seen as concrete implemention of the principles of green industry. LNG, as a cleaner fuel compared to coal and petroleums, served as a solution to reduce carbon emissions and other pollutants. This aligns with global efforts to combat climate change while enhancing air quality. Within the framework of green industry, LNG development involves efficient technological innovations, to lower carbon emission.

1.7.Hypothesis

International cooperation in the development of Liquefied Natural Gas (LNG) projects by Saudi Aramco. Through strategic partnerships with oil companies in various

countries, such as Abu Dhabi's ADNOC, China's SINOPEC, and Thailand's PTT by using two concept there are international cooperation that identifies common interests, policies, agreements, and environmental protection and green industry that identifies technology innovation, resource efficiency, and economic growth.

1.8.Research Methodology

1.8.1. Research Design

This research employs a case study method to analyze the development of Liquefied Natural Gas (LNG) projects by Saudi Aramco to meet sustainable energy. According to Yves-Chantal Gagnon, a case study method involves observing and analyzing a single phenomenon using a holistic approach. This method is not only produces a detailed description of the analyzed situation and events but also provides an in-depth understanding of the actors involved and their interactions.[25] The case study approach will involve secondary data analysis, including LNG production and consumption data, investment figures, and economic indicators related to the development of a sustainable energy cooperations. The data is analyzed to measure the economic impact of LNG projects, energy efficiency, and their contribution to reducing carbon emissions. This research focuses on problem analysis using a naturalistic paradigm and concepts relevant to the research questions.

1.8.2. Research Object

This research focuses on the initiatives and strategies employed by Saudi Aramco in developing LNG projects, including technology, investment, and project management.

[25] Umar Suryadi Bakry, *Metode Penelitian Hubungan Internasional* (Yogyakarta: Pustaka Pelajar, 2016).

It also examines how this collaboration contributes to global energy needs and supports sustainable energy goals. The geographical scope of this research encompasses Saudi Aramco's operational areas in Saudi Arabia and partner countries. The analysis is focused on specific aspects such as LNG liquefaction, infrastructure, supportive government policies, and environmental impacts involving three companies collaborating with Saudi Aramco: ADNOC in Abu Dhabi, PTT in Thailand, and SINOPEC in China.

1.8.3. Data Collection Techniques

This research utilizes document-based data collection techniques, including literature studies and secondary data collection to access relevant information. The literature review includes data from various sources such as academic journals, books, websites, e-books, newspaper articles, reports, and official documents. Other secondary data sources include academic publications, company annual reports, government policies, and relevant news articles.[26] Additionally, the researcher collects data from various official documents and industry reports related to Saudi Aramco's LNG projects. After collecting the data, a filtering and selection process is carried out, followed by categorizing the data into discussion phases. This research aims to provide a comprehensive overview of how Saudi Aramco and its partners collaborate in developing sustainable LNG projects and their impact on the global energy economy.

1.8.4. Data Analysis Techniques

The data analysis technique employed in this research follows the Miles and Huberman model. This model involves three stages: data reduction, data display, and

[26] H. Zuchri Abdussamad, *Metode Penelitian Kualitatif*, ed. Patta Rappana (Syakir Media Press, 2021).

conclusion drawing verification. In the first stage, the researcher gathers data from various documents such as academic journals, reports, relevant books, websites, e-books, and news articles.[27] After collecting extensive data, the researcher reduces or selects data focusing on aspects significant to the research. The next stage is presenting the reduced data in descriptive paragraphs, followed by data verification and conclusion to address the research questions. The results of the data analysis will be summarized comprehensively in Chapter 4 as the conclusions of this study.

1.9.Writing Systematic

The structure of this research consists of four chapters, as follows:

CHAPTER I: INTRODUCTION

This chapter explains the research background, provides an overview of the issues to be studied, research questions outlining the specific problems, and theoretical and practical objectives. It also includes the significance of the research, literature review covering previous studies with similar discussions, a conceptual framework as a theoretical foundation for analysis, hypotheses as preliminary arguments addressing the research questions, research methodology outlines the research process, and a writing structure summarizing the content of the study. Additionally, this chapter provides a brief overview of Saudi Aramco's collaboration in developing Liquefied Natural Gas (LNG) projects to meet the needs of a sustainable energy economy.

[27] Sugiyono, *Metode Penelitian Kuantitatif Kualitatif Dan R&D*, ed. Sutopo, 2nd ed. (Bandung: ALFABETA cv, 2020).

CHAPTER II: LIQUEFIED NATURAL GAS POTENTIAL FOR SUSTAINABLE ENERGY ECONOMY

This chapter explores the potential of Liquefied Natural Gas (LNG) for sustainable energy economy by examining Saudi Aramco's LNG development initiatives. It analyzes how these projects contribute to global energy demand while supporting Saudi Arabia's domestic economy.

CHAPTER III: COOPERATION IN THE DEVELOPMENT OF LIQUEFIED NATURAL GAS (LNG) PROJECT OF SAUDI ARAMCO COMPANIES TO REALIZE A SUSTAINABLE ENERGY ECONOMY

This chapter discusses Saudi Aramco's role as an energy company in developing LNG projects. It also examines various forms of international collaboration undertaken by Saudi Aramco with other oil companies and the steps taken to achieve sustainable economic and environmental goals.

CHAPTER IV: CONCLUSION

This chapter summarizes the research findings regarding Saudi Aramco's collaboration in LNG project development to meet the needs of a sustainable energy economy while preserving the environment. Additionally, this chapter provides recommendations for future research relevant to this topic.