YANGON UNIVERSITY OF ECONOMICS
DEPARTMENT OF APPLIED ECONOMICS
MASTER OF PUBLIC ADMINISTRATION PROGRAMME
(NAY PYI TAW)

A STUDY ON OIL AND GAS PRODUCTION AND EXPORT IN MYANMAR

THAN SOE
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This thesis is submitted as a partial fulfillment towards the requirements for the degree of Master of Public Administration (MPA)

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This is to certify that this thesis entitled **"A STUDY ON OIL AND GAS PRODUCTION AND EXPORT IN MYANMAR"**, submitted as a partial fulfillment towards the requirements for the degree of Master of Public Administration has been accepted by the Board of Examiners.

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ABSTRACT

Oil and natural gas are the two primary fuel sources in the world, and as such, they are important to the energy sector and the global economy. Additionally, it offers benefits like growing GDP participation due to greater manufacturing and increased export revenue from abroad. Myanmar is one of the world's oldest oil producers. This research looks into Myanmar's current and future oil and gas production, as well as how much of it is exported to other countries. This study employs the descriptive approach. This research shows that the Oil and Gas Sector has the second-largest amount of foreign direct investment as of December 31, 2021 (23.03%). The Yadana project is one of the most successful endeavors among the four offshore natural gas production sites (Yadana, Shwe, Yetagun, and Zawtika), with Shwe coming in second. In 2021, the Yadana Project exported the most total (45.41%), followed by the Shwe Project (33.53%). In terms of exports and natural gas production, Yadana has developed into the largest project. In order to avoid becoming more and more dependent on other countries for energy needs, it will be crucial to undertake steps to increase the participation of local enterprises in the development of the domestic energy sector. In order to participate in its offshore sectors, which still have promise, Myanmar must entice foreign investment. The diversification of exporting nations and the search for new markets are also crucial.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
BBL	Barrels
BCF	Billion Cubic Feet
BOC	Burma Oil Company
BOT	Build Operate and Transfer
CNPC	China National Petroleum Company
CNOCC	China National Offshore Oil Corporation
CO2	Carbon dioxide
DEPP	Department of Electric Power Planning
DICA	Directorate of Investment and Company Administration
DOE	Department of Energy
ECP	Electric Power Corporation
EPD	Energy Planning Department
ESB	Electricity Supply Board
FDI	Foreign Direct Investment
FIL	Foreign Investment Law
GDP	Gross Domestic Product
GTL	Gas to Liquid Technology
HDI	Human Development Index
IEA	International Energy Agency
IOR	Improved Oil Recovery
JV	Joint Venture
KM	Kilometers
KMDC	Korea Myanmar Development Corporation
KTOE	Thousand Tons of Oil Equivalents
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MEMP	Myanmar Energy Master Plan
MEPE	Myanmar Electric Power Enterprise
MIC	Myanmar Investment Commission

MMBTU	Million British Thermal Units
MMCFD	Million Cubic Feet per Day
MMSCF	Million Standard Cubic Feet
MOEE	Ministry of Electricity and Energy
MOEP	Ministry of Electrical Power
MOGE	Myanmar Oil and Gas Enterprise
MPE	Myanmar Petroleum Enterprise
MPRL	Myanmar Petroleum Exploration & Production Co., Ltd.
MPPE	Myanmar Petroleum Products Enterprise
MT	Metric Ton
NEMC	National Energy Management Committee
NEMP	National Electricity Master Plan
NEP	National Energy Policy
OECD	Organization for Economic Cooperation and Development
OGPD	Oil and Gas Planning Department
PSC	Production and sharing Contract
PCC	Performance Compensation Contracts
PCML	Peregrine Construction & Management LLC.Inc
PTTEP	Thailand Petroleum Exploration and Production Company
IPR	Intellectual Property Rights
TCF	Trillion Cubic Feet

CHAPTER I
INTRODUCTION

1.1 Rationale for the Study

Asia's Myanmar is renowned for having abundant natural resources. Myanmar has a wealth of natural resources, including jade, gold, different metals, teak, oil, and natural gas. Myanmar began producing oil in Southeast Asia in 1853, and by the turn of the 20th century, its oil industry was the 14th largest in the world. This indicates that Myanmar has more than a century of expertise in the production and marketing of natural resources, particularly in the energy sector, teak, and in actual natural resources. However, the nation still depends on foreign sources for its energy and electricity, making the 2030 national energy strategy crucial to achieving compliance with the National Electric Policy (NEP, 2014). On the other side, it is important to learn about aspects like earning foreign currency through the extraction and sale of natural resources. Energy has played a significant role in the Myanmar economy since 1990, when foreign investment in the oil and natural resource sectors was permitted.

The oil and natural resource industry, which generates foreign currency and accounts for more than 35% of the nation's revenue, continues to be the foundation of all other economic sectors. Myanmar is a producer of oil and gas, minerals, and jewels, which accounts for 4.8% of the country's GDP, 5.2% of state revenue, and 35% of all exports, according to the EITI country report for 2019–20. Government energy strategy is being demanded as a result of the effects of economic expansion, increased manufacturing output, the growth of megacities, rising population, increased consumption among the populace, and intimate human needs.

In actuality, the establishment and management of industrial zones, special economic zones, private sector development policies, and export promotion policies with good governance have been successful in the history of the economic development of Asian developing countries because they were able to provide adequate support. Many academics argued that if governments invested more of the money they received from the export of oil and natural gas in infrastructure projects and human resource

development initiatives, their economies would continue to grow over the long run. Their agreement is based on the reality that the fuel energy sector works with the primary economic pillars of manufacturing, transportation, and agricultural raw materials like fertilizer. Energy resources are crucial for both economic expansion and effective human resource revenue management. On the other hand, experts have noted that the resource curse will occur if foreign currencies are not properly managed and exploited. In order to upgrade their industries' technology, encourage domestic production, and diversify their economies, the countries that export natural resources have implemented massive revenue management plans since 1970. These plans have also been used in human resource development fields like education and health care.

Although Myanmar has historically been one of Asia's top producers of natural gas, the country's current oil and gas output falls short of its needs and hasn't been fully utilized for domestic purposes, so large amounts of natural gas are exported to nearby nations like Thailand and China under 30-year agreements with developers. Many academics concur that gas and oil are the primary drivers of economic growth, but they place special emphasis on the need to determine how all produced fuels are used and in which industries. The electrical industry receives 97% of offshore blocks generated in joint ventures with foreign corporations, with transportation using the remaining 1.73%. This is an example of Myanmar's energy consumption pattern. Less than 1% of the industry is comprised of the production of consumer items, kitchenware, and raw materials.

As part of joint ventures with foreign businesses, the annual average production of offshore natural gas climbed from 3211.47 million cubic feet in 1998 from the Yadana Block alone to 410619.59 million cubic feet in 2008 from the Yadana Block and Yetagun. Furthermore, it grew to 591380.72 million cubic feet from four offshore blocks in 2014. The subject of economic growth is raised when looking at which sector of domestic consumption is the largest because of this increase in production, which has also increased domestic natural gas consumption and natural gas exports.

Myanmar possesses 23 trillion cubic feet (Tcf) of confirmed gas reserves, ranking 39th globally and making up less than 0% of the world's total natural gas reserves of 6,923 Tcf, as of 2017, according to statistics from the world meter website from 2015. (Tcf). Since a significant portion of this money remains, the government will need to determine how it will be allocated among various demands, including those related to domestic consumption, exports, resource management, and public spending.

Both of the previous governments began implementing projects, strategies, and strategic actions for Myanmar's energy sector in 2015.

1.2 Objectives of the Study

Study's Objective The study's goals are to assess Myanmar's existing and potential crude oil and natural gas output, as well as local and export oil and gas consumption.

1.3 Method of Study

The study employed a descriptive methodology and relied on secondary data and material from the Myanmar Oil and Gas Enterprise (MOGE) and other sources, including books, journals, and websites and related publications on the subject of oil and natural gas.

1.4 Scope and Limitation of the Study

The report focuses on Myanmar's entire oil and gas exports and production from 1998 to 2021. The study started in 2011 based on the availability of data on onshore gas production, while offshore gas production was analyzed based on the years when businesses started producing.

1.5 Organization of the Study

This study consists of five chapters. As the introduction part, the rationale, the objective of the study, method of the study, scope and limitation of the study and organization of the study presents in Chapter 1. Chapter 2 is the literature review on the background of crude oil and natural gas sector. Chapter 3 is about review on energy sector in Myanmar. Chapter 4 describes the production, consumption and export of crude oil and natural gas in Myanmar. Moreover, potential production of oil and gas calculated in this chapter. Chapter 5 presents conclusion including findings and recommendation.

CHAPTER II
LITERATURE REVIEW

2.1 Concept of Natural Resources and Sustainable Development

Natural resources are defined differently by various scholars and institutions, but the overall objective is essentially the same. Natural resources are, for instance, things made by nature that people can use. They include elements of the natural world (such as soil and water) as well as sources of energy (such as coal and gas) that help to satiate human needs and desires (Barsch and Bürger 1996). Another is that the word "natural resources" refers to "resources" that are drawn from the natural state, whereas actual technology, economic conditions, and social conditions refer to all systems that are beneficial to humans (Flavin, 2002). Natural resources are defined as "natural assets (raw materials) found in nature that can be exploited for economic production or consumption" by the OECD (2005).

In actuality, natural resources like sunlight, air, soil, water, plants, animals, and fossil fuels may be discovered in the environment and developed without human interference. Natural resources can be split into two categories: non-renewable and renewable. Natural resources are frequently referred to as "natural capital." The most common classification of natural resources is one which separates them into nonrenewable resources (such as mineral substances and fossil fuels) and renewable resources (such as solar energy, wind energy, tidal energy, agricultural lands, air, and water) (Zaharia and Suteu, 2010). Briefly explain that because renewable resources can regenerate after being harvested, their stockpiles theoretically might be used indefinitely. A brief definition of a non-renewable resource is that it exists in a finite amount and does not regenerate after being collected and used. As a result, non-renewable resource supplies in the ecosystem are reduced as they are utilised.

The idea of non-renewable resources and the usage of renewable resources is the foundation on which sustainable development today has formed. Today, it is necessary to consider how individuals utilize natural resources, whether they do so efficiently and effectively, and what impact those sectors have on people. This is

because different people use natural resources in different ways. Natural resource sustainability actually only pertains to what renewable energy sources can do. Global cultures have been plagued by issues including air pollution, unlimited urban growth, overcrowding, climate change, and natural disasters that have caused extensive harm every year as a result of the overexploitation of the world's natural resources. It is essential to comprehend the benefits and drawbacks of such natural resources as well as the development principle.

Development is a dynamic process that provides people the chance to pursue a stable life where their basic requirements are satisfied. It is a process that offers the chance to produce and innovate, opening up a chance to create a better future for everyone (SOLOMON, 2007). Furthermore, development occurs when strong institutions are in place, good governance is practiced, and both emerging and developed nations are able to manage their national difficulties in an efficient and sustainable manner (USAID,2015). Development is a dynamic process that provides people the chance to pursue a stable life where their basic requirements are satisfied. It is a process that offers the chance to produce and innovate, opening up a chance to create a better future for everyone (SOLOMON, 2007). Furthermore, development occurs when strong institutions are in place, good governance is practiced, and both emerging and developed nations are able to manage their national challenges in an efficient and sustainable manner (USAID,2015).

Making progress toward an economic system that uses natural resources in a way that doesn't deplete their stock or otherwise jeopardize their accessibility to future generations of people is known as sustainable development. Natural resources and sustainable development, however, are both crucial. They are mutually beneficial. Due to the idea of extracting natural resources very sparingly, world leaders are advocating for conservation that continuously improves natural resources. The process of sustainable conservation of natural resources will eventually become crucial in Myanmar, where natural resources are sold.

2.2 The Origin of Oil and Natural Gas

Natural gas comes from trees that died millions of years ago., just as fossil fuels. Animal and microbial remnants are used in chemical reactions to create it. The soil layers were eventually covered by sediments and rocks as animals and microbes died and rotted. These biomaterials are exposed to increasing temperatures and pressures as

they move further into the Earth's interior throughout time. The carbon atoms in organic matter disintegrate at these pressures and temperatures, creating the natural gas known as thermogenic methane (National Geographic,2021).

Particularly, natural gas gets mixed with oil frequently and is covered by oil deposits above the Earth's surface. In the lowest layers of the earth's crust, natural gas reserves are frequently the only ones to be discovered. The region where the rock layers are found is known as a sedimentary basin, and it serves as a barrier to keep natural gases from seeping out onto the earth's surface. Fossil fuel reserves can be found in vast quantities in these sedimentary valleys and include natural gas, coal, and oil.

Conventional natural gas is the natural gas that is found easily mineable beneath rocks in the crust of the earth. Unconventional natural gas is the name given to the shale gas that is found beneath sandstone and shale. In the future, natural gas may also be known to as conventional natural gas due to ongoing technological advancements (Science Direct, 2021). Unconventional natural gas includes natural gas and methane hydrate gas found in the interior of the Earth. It also includes deep natural gas, shale gas tight, and gas coalbed methane. The world has deep natural gas deposits that are 4,500 meters below the surface, but even with advanced exploration and drilling techniques, the cost of extracting and producing this gas is still high (National Geographic Society 2022).

Although natural gas can be found worldwide, the South Pars (Persian) and North Dome natural gas fields in Iran and Qatar have the greatest natural gas reserves (Wikipedia, 2021). It is estimated that there may be 51 trillion cubic meters of natural gas in this gas field. The nations producing the most natural gas globally, according to the World Atlas organization's records of exploration and production in 2021 (Worldatlas.2022), are as follows:

(a) The United States: The United States, the largest natural gas producer in the world, produced 934.2 billion cubic meters of natural gas in 2021, or more than 23% of all natural gas produced worldwide.

(b) Russia: Russia produced 707.7 billion cubic meters of natural gas in 2021, accounting for 17% of the world's total production, making it the second-largest natural gas producer in the world. In addition, Russia has the largest natural gas reserves, with 51 trillion cubic meters of natural gas, and is the world's largest natural gas exporter, with 240 billion cubic meters of natural gas exported and sold in 2021.

(c) Iran: In 2021, Iran produced 256.7 billion cubic meters of natural gas, ranking third in the world. Additionally, Iran will increase its daily natural gas production to 130 million cubic meters by 2022.

(d) China: In 2021, China generated 209.2 billion cubic meters of natural gas, ranking fourth in the world. China is still the world's top natural gas importer, with 131 billion cubic meters imported in 2021, based on local demand.

(e) Qatar: Qatar generated 177 billion cubic meters of natural gas in 2021, ranking fifth in the world.

2.3 Role of Natural Gas and Oil in Economic Growth

Natural resources, particularly oil and gas, are an integral part of economic growth. Oil and gas, among other energy sources like coal, solar, wind, and nuclear energy, continue to be essential to the nation's economy, supporting things like transportation, power, industry, and households. Many economists and development economists have studied the relationship between oil and other natural resources and economic development. It is important for development economists to recognize that there are at least four connections between natural resources and economic growth. They are: (1) this sector can provide a lot of jobs, (2) the oil and natural resource sector can contribute other sectors, (3) This industry can increase government revenue, allowing it to invest more in infrastructure. For instance, the government of Myanmar receives significant rent, royalties, and lease payments from the oil and natural gas sector. (4) Finally, the nation can benefit from the manufacturing and factory sector's access to cheap supplies of natural gas and oil. While some scholars argue that oil and natural resource earnings have resulted in economic growth, others are pessimistic and argue that this is not case.

Particularly emphasis should be given to how to use natural resource income in order to promote economic growth and development in developing nations that export natural resources. This is especially true given that oil and other natural resources serve as the main engine for the growth of the manufacturing and industrial sectors. Actually, more than 60% of a developing country's foreign income comes from the sale of oil and natural gas. Only the beneficial use of infrastructure is the subject of real economic growth, and this income is used for the development of technology process. An important lesson for developing nations that depend on natural resource revenues is how frequently economic crises affect nations that export oil and other natural

resources. After the global economic crisis of 1980, nations that traded oil and other natural resources and adhered to the idea of economic growth were forced to alter and support their economic models. One of those methods is the establishment of a private natural resource revenue fund. Economic diversification is being done to compete with foreign exports by importing the machinery that is primarily required for the home manufacturing industry from their oil and gas income and purchasing only the essential raw materials from domestic companies, and starting local production. The events of 1980 were successful. Therefore, it must be determined that oil and natural gas are fundamental to supporting other economic activities and are closely tied to the principle of economic growth.

2.4 Resource Curse in Energy Oil Economy

The failure of many resource-rich countries to completely capitalize on their natural resource wealth and for their governments to effectively address issues related to public welfare is known as the resource curse (also known as the paradox of plenty) (NRGI Reade, 2015). The resource curse is closely tied to the economy of oil and other natural resources in developing nations. The phrase "resource curse" refers to the paradoxical situation where a nation experiences economic underperformance despite having access to valuable natural resources. The resource trap and paradox of plenty are other names for the resource curse (Fernando, 2020).

There are many relevant terms for the resource curse, including inefficient budgeting, weak institutions, an authoritarian political system, the Dutch disease, and conflict, however this study only focuses on the Dutch disease as it relates to the economic growth principle. Despite the expectation that better development outcomes would follow the discovery of natural resources, resource-rich nations frequently exhibit higher rates of authoritarianism and conflict as well as worse rates of economic stability and growth than their less resource-rich neighbors. "Resource-rich governments have a tendency to underspend on health, education, and other social services and overspend on government salaries, wasteful fuel subsidies, and huge monuments" (NRGI, 2015).

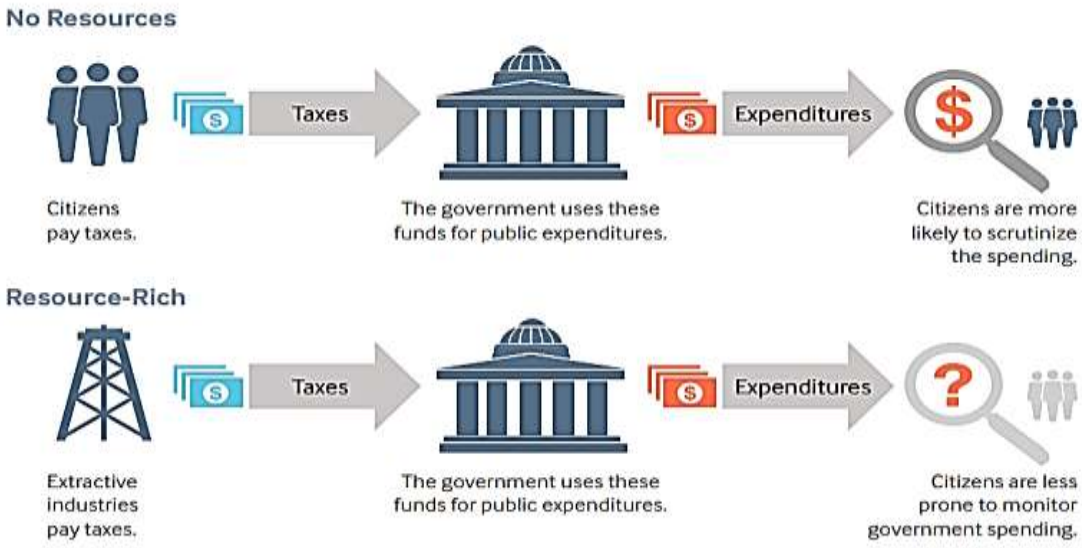
Numerous academic studies have found that despite having these resources, the majority of African nations are still authoritarian and impoverished. (Congo, Guatemala). Myanmar is another country that is abundant in natural resources like jade, gold, and teak, although it is debatable whether such a precious resource has been

cursed up until this point. Natural resource riches ripening to give rise to a struggle for few resources, which then results in poor institutional quality and slower growth, is one theory for the natural resource curse. The argument is that the high rents that can be obtained from natural resources encourage both public and private actors to engage in rent-seeking behavior, greed, corruption, or even civil war, which discourages entrepreneurship and other pro-growth activities (IMF, 2007).

Due to their high upfront costs, prolonged production timelines, site-specific nature, scale (also known as large rents), price and production volatility, non-renewable nature, and industry secrecy, political scientists and economists argue that oil, mineral, and gas wealth is distinct from other types of wealth. The following are some of the top observations and thoughts on how these distinctive characteristics of natural resource revenues provide new problems for nations (NRGI Reade, 2015).

However, all parties ultimately agreed that managing the revenues from oil and other natural resources is important. Because there is a plethora of information about both the positive and negative effects that natural resource income has had on numerous economic sectors available from the history of resource revenues. Dutch disease, for instance, is related to a general observation.

Figure (2.1) The Flow Chart of Oversight Incentives in Resource Rich and Resource-poor Countries



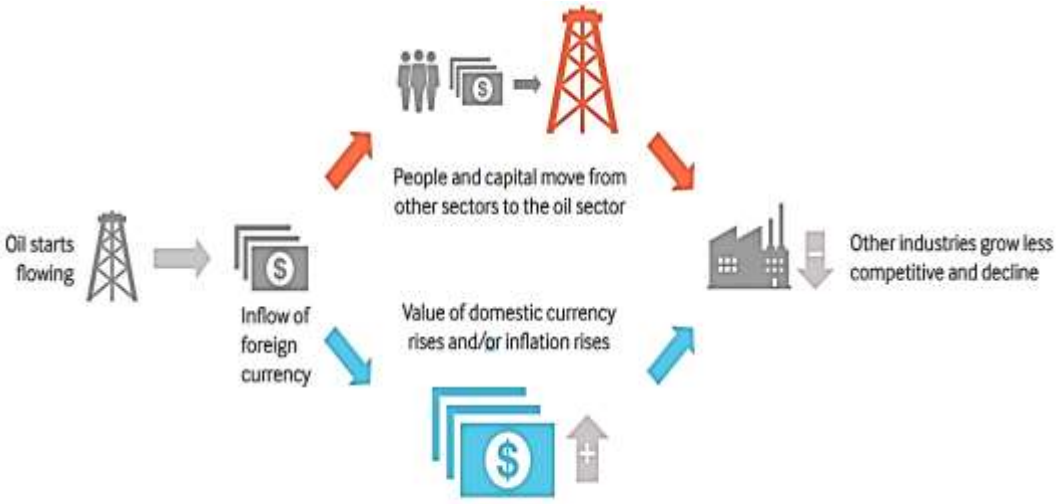
Source: NRGI, the Resource Curse, the Political and Economic Challenges of Natural Resource Wealth, 2015

The concept of collective duty and obligation between the government and its population has been formed through taxation and the use of public spending for the public welfare, as shown in the Figure (2.1), in countries without a lot of natural resources.

Due to the money collected from citizens, the principle of mutual responsibility has been created in which citizens also monitor and control government spending. The government makes money by extracting and selling these natural resources since the nation has an abundance of natural resources. The revenue from these resources has been used by the government to fund projects for public works. These income streams are also not transparent. Citizens' taxes are not collected, which results in a scenario in which there is no accountability to them. Scholars have found that the revenue from resources has become similar to a resource curse as a result of the above picture being so simply explained.

The Economist magazine first used the phrase "Dutch disease" in 1977 to describe a crisis that occurred in the Netherlands following the 1959 discovery of enormous natural gas reserves in the North Sea (CHEN, 2021). Large increases in revenue from natural resources can be harmful to other economic sectors, especially export-based manufacturing, because they can lead to inflation or exchange rate appreciation and shift labor and resources from non-resource sectors to resource sectors. This condition is called "Dutch disease." Large portions of the economy can suffer from inflation and exchange rate appreciation within a few years, but their effects can persist for decades 2017 (NRGI Reade). Natural resource depletion has a negative impact on other industries in Trinidad and Tobago, Venezuela, Iran, and Russia, all of which have either stunted manufacturing sectors or experienced a sharp decrease in manufacturing. These effects can be reduced if the nation has the ability to absorb resource revenue inflows and transform them into tangible investments like roads and electricity; if the government uses resource revenue to fund economic initiatives that spur growth outside the resource sector; or if the government invests a portion of its resource revenue in foreign assets (NRGI Reade, 2015). It is likely that the government budget was somehow balanced with the natural gas export revenue that was received from abroad. Therefore, it is necessary to study Dutch disease in Myanmar.

Figure (2.2) The Flow Chart of Dutch Disease



Source: NRGI, the Resource Curse, the Political and Economic Challenges of Natural Resource Wealth, March 2015

It is explained that the initial stage of oil production starts above the figure (2.2). The second step after beginning oil production is to export and sell abroad. These exports and sales will bring in foreign currency as revenue for the nation. The value of the nation's currency will increase if you earn a lot of foreign currency. He will have to deal with two circumstances as a result of the growth in the worth of his nation's currency. First, when the value of this nation's currency grows, inflation will once more be reflected. Due to the appreciation of their national currencies and the high cost of selling imported goods, it will be challenging for other countries to purchase and consume domestically produced item. Due to the decrease in exports, the factories in those nations will therefore have to close. The income of residents and the proceeds from oil sales will simultaneously be shifted to other, more profitable economic sectors. The above picture illustrates how declining oil production, which will result in Dutch disease, is the cause of dropping oil prices and how the country would suffer as a result. Dutch disease is an economic term describing the unfavorable effects that can result from a sharp increase in a country's currency's value. From the economic point of view, it causes a rise in imports and a deterioration in the price competitiveness of the affected country's manufactured good exports.

2.5 Reviews on Previous Studies

As for earlier research, it includes analyses of the production of crude oil in Myanmar by Mya Htwe Yee (2010), a study on the production of oil and natural gas in Myanmar by Soe Hlaing Maung (2011), and "A Study on Crude Oil and Natural Gas Sector in Myanmar" by Wathone Kyaw Swe (2019).

According to Mya Htwe Yee (2010), she suggested that "Analysis on production of Crude Oil in Myanmar," made the suggestion that after the adoption of the Foreign Investment Law in 1998, the Ministry of Oil and Gas Enterprise had signed Crude Oil Exploration and Production Contracts with multinational corporations. With 154 licensed foreign enterprises, MOGE has been operating with foreign firms in 25 onshore blocks, 13 offshore blocks, and other locations. Additionally, MOGE extended an invitation to additional investors to provide funding and technology for the exploration of new oil fields and the sustainability of current crude oil production. According to Soe Hlaing Maung, (2011), who wrote a thesis titled "A Study on Oil and Natural Gas Production in Myanmar," not enough crude oil is produced in Myanmar to meet domestic demand, thus oil is imported from other nations. Wathone Kyaw Swe, a 2019 MPA graduate, also worked on his paper, "A Study on Crude Oil and Natural Gas Sector in Myanmar," in which he stated that natural gas and crude oil are both components of the energy sector, which not only helps to meet domestic demand but also strengthens the country's economy by increasing GDP and playing a crucial role in infrastructure development. His research was conducted between 2000 and 2016. Natural gas production was discovered to be in surplus for domestic use, thus under 30-year contracts with developers, it is exported to Thailand and China.

CHAPTER III
OVERVIEW ON ENERGY SECTOR IN MYANMAR

3.1 Historical Oil and Natural Gas Sector

Myanmar is one of the oldest oil exporting nations in the world and has a long history of oil and gas exploration. Myanmar began exporting oil in 1853 and is currently Southeast Asia's third-largest natural gas producer. English first entered Myanmar's oil sector in 1871. Yangon Oil Company is the first company. The entire nation of Burma was seized following the third war in 1885, and the BOC Company was established in 1886. The BOC Company shifted hand-loom mills over to machine mills in 1887. It produced 5.09 million barrels in 1818, placing it 14th globally. Until 1900, BOC was a monopoly.

As the oil sector grew rapidly in 1902, a large number of foreign companies entered the market. These periods must be regarded as the first in order to start studying the history of foreign investment in Myanmar's oil industry. During the period of 1925, the foreign companies that worked in parallel with BOC Company as fallows;

1. British Burma Petroleum Company (BBPC)
2. Rangoon Oil Company (ROC)
3. Indo-Burma Petroleum Company (IBPC)
4. Nathsingh Oil Company (NOC)
5. Yoma Oil Company (YOC)
6. Moollah Oil Company (MOC)
7. Standard Oil Company (SOC)
8. Po Kin Oil Company (PKOC)
9. Irrawady Sindicate (IS)

Yanangyone and Chouck are the main oil-producing areas (Than Tun, 2019). About 8 million barrels of oil were produced annually between 1922 and 1940. Records show that the colony under British rule produced 250 million barrels of oil. Oil given rise to Biotech, which went on to build a 325-mile oil pipeline. The oil refinery was completed and crude oil production increased in 1925, it must be said. All of the oil

wells were upside down when the British fled the war in 1942. Not even just pits, but pipelines, oil refineries, and storage tanks as well. Every single power plant was destroyed. After the conflict, the BOC Company went back to Myanmar and kept running the oil business there. Myanmar's oil sector grew further in 1961 as a result of the entry of the American Unocal oil corporation. The entire oil production and brewery distribution work was carried out by BOC Company both during the colonial era and after Myanmar gained its independence in 1962.

The return of English oil companies occurred between 1946 and 1954. The three English oil companies BOC, IBP, and BP had merged to become the AOC Oil Group at the time of this report. In order to use the damaged oil industry to create additional capital, those companies ceased working on it. Instead, they focused solely on increasing profits in order to reduce costs. Consequently, a strike by oil employees took place in 1948. When the original corporative business agreement could no longer be carried out, the AOC Oil Company started attempting to cut the number of employees. The oil company clarified that they had stopped using further capital as well. They notified the government of their intention to reduce the labor so that it might contribute capital to address the problem of workers losing their jobs. Because the government had only begun to participate in the oil sector, the incident had its beginnings as a joint venture.

The government, BOC, IBP, and BBP made an agreement and founded a joint venture company in 1954. The government owns 33%, 55%, 10%, IBP, and 2% of each of the companies' shares, respectively. The government's ownership successfully rose to 51% in 1960. The government's goal is to increase the production of ethnic technology. It's said that the goal was to make it possible to hire and expand ethnic companies.

Under U Ne Win's Revolutionary Council, the Myanmar government acquired all of the shares of the joint venture between a foreign firm and the Myanmar government in 1962 after spending 625 million kyats for 49 percent of the shares. Its name was changed to People Oil Industry (POI) in 1963, and the Myanmar government now owns it. Some scholars continue to claim that the U Ne Win government nationalized them and then took them without paying compensation.

Foreign oil companies at the time believed that Myanmar's oil sector would fail, yet they were quite successful up until the 1980s. Burmese Oil and Gas Mechanism was

able to investigate a number of other oil fields after discovering the Mann oil field in 1970, which would later usher in a new era for Myanmar's oil industry.

3.2 Legal and Institutional Framework

Myanmar Oil Corporation (MOC) was renamed Myanma Petroleum Corporation in 1970 as a result of the company's expanding production and operations. The Myanma Petroleum Corporation (MPC) is engaged in oil exploration, mining manufacture, running petroleum refineries, distributing petroleum products, and selling petroleum products. It was under the control of the of mining until 1975, at which point the production and distribution of oil was transferred to the ministry of industry (2). (U Than Tun,2019). MPC, the Myanmar Petroleum Corporation, was also incorporated into that ministry in 1977. The Ministry of Energy was established independently in 1985 and was in charge of both energy and electricity. The name of the company was changed from Myanmar Petroleum Corporation (MPC) to Myanmar Oil and Gas Enterprise in 1989. (MOGE). In 1997, Myanmar was in charge of all energy-related sectors when it became the Ministry of Energy.

The ministries of electricity and energy were combined into one in 2016 under the civilian government, similar to a ministry of energy and electricity (MOEE). The Ministry of Energy and the Ministry of Electricity have yet again been divided as of 2021. Myanmar has a long history of producing gas and oil. Only foreign-owned oil corporations dominated Myanmar's oil sector during the colonial era, hence the laws, procedures, and institutional framework around the oil sector were developed at the direction of the ruling British. Burma Oil Company (BOC) alone has monopolized Myanmar's energy sector, despite the country being classified as having a market economy system.

As a result, during the parliamentary era that after independence, the government was able to hold a majority of the shares before eventually becoming the sole shareholder. The role of laws and institutions did not alter during this time because the economy was based on the western market economic model. Myanmar Socialist ideology changed the institutional and legal systems in 1962 under U Ne Win's Revolutionary Council. The name of the responsible department that applied to the socialist model was modified by the socialist government. his sector was governed by five regulations prior to 1962, and two Acts and one regulation followed. In 1988, when the military once more seized power, the government said that it would reform this

sector's policies and implement a market economy. Many foreign oil exploration companies visited Myanmar in the 1990s to invest in the discovery and production of oil and natural resources when the world energy market accepted the idea of trading natural resources. Since then, it has become crucial for the ministries and departments in charge of the Myanmar energy fuel sector's laws, institutions, and practices to play their share in adhering to international standards.

In addition to producing electricity and power, the Ministry of Electricity and Energy is in charge of the oil and gas industry. After 2021, MOEE has been reorganized into the Ministry of Electricity and the Ministry of Energy. The departments in charge of the oil and gas industry continue to play the same role, nevertheless. The Myanma Oil and Gas Enterprise (MOGE), Myanmar Petrochemical Enterprise (MPE), and Myanmar Petroleum Products Enterprise are three state-owned companies that are under the control of the Ministry of Electricity and Energy in terms of oil and gas (MPPE). Nowaday, The Ministry of Electricity and Energy is the main government department responsible for the oil and gas sector and is responsible for the following departments:

(a) Oil and Natural Gas Planning Department (OGPD).

The Department develops energy policy and is in charge of coordinating and discussing initiatives for the growth of the energy sector. Additionally, they are jointly responsible with Myanmar Oil and Natural Gas Enterprise for managing block contracts, exploration, production, and sales, as well as internal tenders for oil and natural gas blocks in shallow sea and offshore deep water.

(b) Myanmar Oil and Natural Gas Enterprise (MOGE).

Oil and gas exploration and production is a state-owned business; this division is primarily in charge of carrying out oil and natural gas operations in cooperation with private businesses. The department is also in charge of organizing and distributing oil and natural gas business tenders to foreign businesses. As stated in the report by (MGNMP, 2018), MOGE is also in charge of the upstream petroleum subsector and is accountable for the following four essential tasks: I to conduct its own oil and gas exploration and production; (ii) to build its own pipelines to deliver domestic natural gas; and (iii) to provide compressed natural gas for use as a car fuel substitute.

(c) Electricity distribution business (ESE).

The department is involved in the production and distribution of electricity outside the main grid, micro-electricity, the installation of diesel and natural gas power plants, and operational management.

(d) Myanmar Petrochemical Enterprise (MPE).

The department's duties include oil refineries, and it controls five nearby factories that produce fertilizer and other oil-related products.

(e) Electricity Generation Enterprise (EPGE).

The Yangon Electricity Supply Corporation (YESC) and Mandalay Electricity Supply Corporation are parts of the conglomerate, which purchases electricity and distributes it to consumers in Myanmar (MESC).

Oil and Gas Law in Myanmar, the regulations were amended based on the laws enacted during the colonial era. Some laws are still being approved and used. Notable oil and gas laws are as follows:

(a) Petroleum Act (1918).
(b) Petroleum Act (1934).
(c) Petroleum Regulations (1936).
(d) Petroleum Rules (1937).
(e) Oilfield Labor and Welfare Act (1951).
(f) Petroleum Resources Development Regulations Act (1957).
(g) Myanmar Petroleum Block Regulations (1962).
(h) Petroleum Resources Development Regulations Amendment Act (1969).
(i) Petroleum Regulation Act (1987).
(j) 2010 Law Amending the Oilfields Act
(j) Essential Goods and Services Act (2012).
(k) Environmental Protection Act (2012).
(L) Myanmar Electricity Law (2014)
(l) Environmental Impact Assessment Regulations (2015).
(m) Petroleum and Petroleum Products Act (2017)
(n) Petroleum Mining Act (2017)
(o) Importation of petroleum and petroleum products, storage Shipping and Distribution Order Announcement No. (100/2013).

3.3 Government Sector Strategy, Policy, and Plans

Production of natural gas and oil, particularly natural gas, has increased annually in Myanmar. Based on the expectations of international organizations for Myanmar's economic development, the Myanmar government has formulated the Myanmar energy strategy, energy policy, and plan. Up until 2011, the nation's oil and gas sector was essentially cut off from investment because of long-standing international sanctions against the military rulers. The International Monetary Fund (IMF) forecasts that the GDP rate would remain over 7% at least through the mid-2020s. The Asian Development Bank's Energy Master Plan estimated the GDP growth rate at 7.1% through 2030 (ADB, 2015: 7). (IMF, 2018). For example, it is predicted that growth will be 7.6% 2015 - 2020, 6.3% 2020- 2030, and 5.0% 2030 - 2040. (ERIA, 2018). Income per capita will increase along with economic growth. GDP per capita, which influences the level of energy demand, has increased dramatically since 2010, according to the ERIA research from 2018, and is expected to continue to rise, reaching $731 in 2020, $1,219 in 2030, and $1,896 in 2040. Due to the impact of rural electrification, GDP growth, and population growth, Myanmar's final energy consumption (FEC) is predicted to increase from 12.2 mtoe in 2012 to 21.9 mtoe by 2030, with a 3.0% compound annual growth rate (MEMP, 2015). By 2030, the preferred energy scenario predicts a mix of energy output of 57% hydropower, 30% coal, 8% natural gas, and 5% wind (MEMP, 2015). By ensuring sustainable energy sector development and environmentally responsible resource management, the Myanmar Energy Master Plan places a priority on the nation's long-term welfare. Then, it explains the assumptions underlying several predictions of the energy demand between 2014 and 2035. (MEMP, 2015).

Therefore, once the government recognized how crucial the energy sector was to industrialization and economic growth. Private banks were permitted to trade foreign currencies in 2011 as a result of President U Thein Sein's economic reforms. Multiple exchange rates in Burma were eliminated on April 2, 2012, and the Burmese kyat was put into a controlled float by the Central Bank of Myanmar. A new Foreign Investment Law was signed by President Thein Sein in November 2012, and Special Economic Zones (SEZs) are now being constructed in Dawei and Thilwar. During the U Thien Sein era, the US removed the majority of the sanctions list. A comprehensive "Framework for Economic and Social Reforms" outlined the government's broad measures to meet these objectives by 2030 as well as more immediate priorities for the

next three years. Every citizen may purchase affordable SIM cards in 2014 as a result of the entry of numerous foreign investors in the telecom industry. The NCDP was also set up at the same time to carry out long-term sustainable development.

Regarding the energy sector, the Myanmar government made an effort to be creative in enacting the laws and regulations required to encourage foreign investment, the process of capital investment opportunities, the institutional reform principles for those sectors, and the publication of strong research data reports. The government has effectively conducted tendering procedures in the energy industry using the international system in addition to engaging foreign investors. To carry out the country's energy policies, a National Energy Management Committee was also established.

The following duties and functions regarding the National Energy Management Committee by summarized;

1) To formulate National Energy Policy
2) To formulate Energy Regulation for ensuring implementation of energy development
3) To supervise the facts and figures on energy for ensuring qualified and accurate statistics
4) To coordinate with Privatization Commission and Myanmar Investment Commission
5) To fulfill the current requirements by laying down short-term plans
6) To lay down long-term plans based
7) To generate electricity with the use of coal as in many other countries
8) To strive for generating electricity depending on regions and topographical situation
9) To formulate necessary measures for adequate supply of energy
10) To take systematic measures in laying down development plans
11) To prioritize and supervise oil & gas and natural resources
12) To carry out oil & gas production through local and foreign investments
13) To sell out value-added petrochemical products
14) To coordinate natural gas and electricity generation
15) To adopt convenient pricing policy
16) To explore environmental impact and social impact assessment
17) To enforce energy sufficiency ambition in industry, transport and household sectors

18) To invite foreign and local investments
19) To conduct necessary assessment to participate in civil nuclear energy activities
20) To adopt National Energy Security Strategy
21) To make arrangement for drafting necessary law, rules and regulations and so on.

The Essential Goods and Services Act (2012), the Environmental Protection Act (2012), the Environmental Impact Assessment Regulations (2015), and the Myanmar Electricity Law (2014) are only a few of the laws that have been enacted in relation to the reform of the energy sector between 2011 and 2016. Another order is the Importation of Petroleum and Petroleum Products, Storage Shipping and Distribution Order Announcement No. (100/2013).

According to the Myanmar Electricity Law of 2014, the law's objectives are to: 1) reduce the cost of energy generation via planning, satisfy the demand for electricity, and provide electrical services; 2) expand the number of electricity generation projects; 3) enable the safe and widespread use of electricity; 4) carry out electrical work in accordance with the defined processes; 5) enhance domestic and foreign investment in the power sector; 6) to set electricity rates; 7) to promote openness and transparency in the laws and regulations governing electricity efficiency; 8) the creation of a commission and its responsibilities (to determine the electricity tariffs, to provide the necessary advice, etc.). After 2010, the governments conducted numerous studies and published numerous papers regarding Myanmar's energy day by day and update by update with assistance from the international community. The Myanmar Energy Policy (MEP 2014) and Myanmar Energy Master Plan are two recently published policies for the energy sector (2015). In order to undertake short-, medium-, and long-term initiatives related to the energy sector, Myanmar's National Energy Policy (NEP, 2014) has formulated the following policies, which are summarized below:

(1) To implement short term and long-term comprehensive energy development plan based on systematically investigated data on the potential energy resources
(2) To institute laws, rules and regulations in order to promote private sector participation and to privatize (100% FDI, Joint FDI, International IPP, local IPP/SPP/VSPP) State Energy Organizations in line with State Economic Reform Policy
(3) To compile systematic statistics on domestic demand and supply of various different kinds of energy resources of Myanmar

(4) To implement programs by which local population could proportionally enjoy the benefit of energy reserve discovered in the areas
(5) To implement programs on a wider scale, utilizing renewable energy resources such as wind, solar, hydro, geothermal and bioenergy for the sustainable energy development in Myanmar
(6) To promote Energy Efficiency and Energy Conservation
(7) To establish R&D, D&D (Research, Development, Design, and Dissemination) Institution in order to keep abreast with international practices in energy resources
(8) To promote international collaboration in energy matters
(9) To formulate appropriate policy for energy product pricing meeting economic security of energy producers and energy consumers.

Policies regarding the oil and gas sector are:

(1) Emphasize to fulfill the domestic energy requirement on a priority basis
(2) To implement sustainable energy development
(3) To promote energy efficiency and conservation
(4) To promote alternative energy uses for household energy
(5) To promote private sector participation in energy sector
(6) To minimize environmental impact and social impact in the energy implementation project
(7) To promote extended utilization of new energy resources and renewable energy resources
(8) To cooperate with other relevant organizations for the compilation of reliable and accurate statistics pertaining to energy production, energy supply, demand and energy projection (NEP, 2014).

The Myanmar Energy Outlook 2040 report states that the country's energy sector is becoming more open and transparent. These elements are connected to the strategies for the energy industry during the two different governments. Projects and policies will be made public. These elements are connected to the energy sector's strategy under the two different governments, whose projects and policies will be released publicly.

3.4 Government Reform in the Oil and Gas Sector Since 2011

Natural resources like gas and hydropower, which, if completely exploited, could provide the majority of the country's daily energy needs, are abundant and rich in Myanmar (Myanmar Energy Outlook 2040, 2020). The energy sector has a long history dating back more than 120 years. Regarding oil and natural gas, however, the principle of domestic production and consumption have not yet fully converged.

In order to reach the target of 75% electrification rate by the end of 2021/2022, the government made it a priority during the New Democratic Government's (2011-2015) tenure to increase the electrification rate from its current level of 26% to 75% by that date. On the other hand, the government made plans to increase its generation capacity over the next 10 years at a rate between 500 MW and 1,000 MW on a yearly basis, reaching a total of about 16,665 MW at the end (NEP, 2014). The 2030–2031 government plan calls for the construction of new electric power generation plants that will utilize a combination of energy sources that includes 38% (8896 MW) hydropower, 20% (4758 MW) natural gas, 33% (7940 MW) coal, and 9% (2000 MW) renewable sources (NEP, 2014).

The Myanmar Energy Master Plan was announced by the government in 2015 with the purpose of supplying long-term security and reliability of energy supply through the development of a National Energy Management Committee. The Myanmar Energy Master Plan (MEMP) 2015, which is currently the only strategic policy document used to direct future energy-related policies, also promotes the utilization of water resources as a source of renewable energy for generating electricity, saving non-renewable sources like fossil fuels for alternative and future utilization (NGMPM, 2018). The Myanmar Energy Master Plan was divided into seven chapters: institutional setup, long-term optimal fuel mix, long-term economic outlook, historical energy balance, energy resource inventory, and energy supply outlook. This report covers every energy sector in Myanmar in detail. It has been concluded through researching Myanmar's energy sector policies that they will benefit international investors, particularly in terms of energy investment.

In April 2016, a civilian government led by the NLD Party, which had swept to win in the 2015 election, was elected. The New Civilian government was established with 21 ministries after the first and previous governments' 36 ministries were reorganized. The reform of state-owned firms is an essential component of the

economic direction. The growth of the energy sector is also a part of the government's 100-day project after taking office.

After the election of a civilian government, the Ministries of Electric Power (MOPE) and Energy (MOE) were combined into the Ministry of Electricity and Energy (MOEE). By working together, ministry activities became more complicated, resulting in difficult-to-manage administrative procedures, financial plans for state-owned enterprises, and departmental conflicts for leaders. By 2020, the civilian government will have implemented its LNG plan for one million households. Strong reports were published for the development of Myanmar's energy sector while it was under a civilian government. The three papers are the Myanmar Energy Outlook 2020, Myanmar Energy Statistics 2019, and Myanmar Natural Gas Master Plan for Myanmar 2018. The legislation of two acts, the Petroleum and Petroleum Products Act (2017) and the Petroleum Mining Act (2017), have been released.

The policy actions of Natural Gas Master Plan for Myanmar can be summarized as follows:

(1) Create demand, Natural Gas demand is created
(2) Encourage and accelerate domestic upstream development
(3) Enhance the resilience of the pipeline network
(4) Reform the energy pricing system
(5) Manage quality issue with natural gas
(6) Grow human capital to utilize

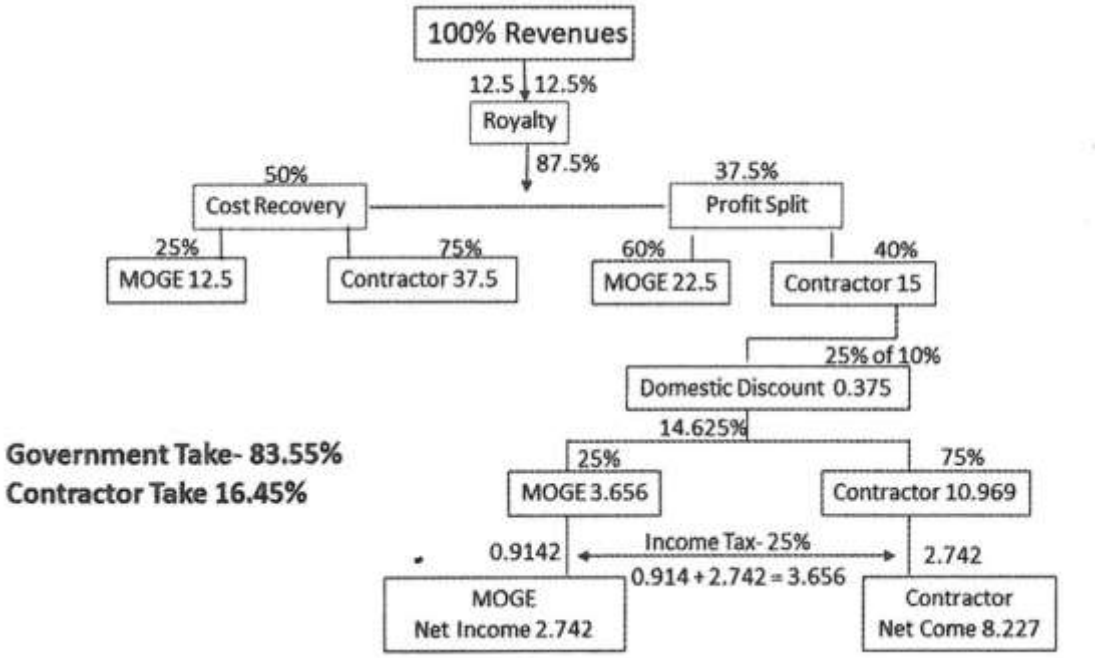
And the purposes of Natural Gas Master Plan objectives are as follows;

(1) To forecast Myanmar’s natural gas demand, supply, and trade balances through 2040
(2) To explore the possibility of using gas in large cities in Myanmar
(3) To understand what infrastructure must be developed to ensure that the supply of natural gas or liquefied natural gas (LNG) meets future demand
(4) To consider policy options to ‘gasify ’the country’s energy mix.

The MOEE has updated and published information about Myanmar's extractive industries during the civilian government as part of the Extractive Industries Transparency initiative (EITI report 2017-18). Standard Terms and Conditions of Production Sharing Contracts for Onshore, Offshore, and Deep-Offshore Blocks have

also been published by MOEE. Everyone can study part of the joint venture agreements with international corporations, according to newly available information from the MOEE. Those are as follows:

Figure (3.1) Flow Chart of Production Sharing Contract with Foreign Companies



Source: the EITI report, March 2018

Oil and gas exploration is listed among the economic activities that are permissible with the approval of the relevant ministry, according to two notifications released by the MOEE on 15/2017. Up until now, foreign oil and gas companies have been compelled to collaborate with local companies. According to Rule 22 of Notification 35/2017, joint venture businesses engaged in economic activities that are forbidden or limited, including oil and gas exploration, should not have more than 80% foreign capital. An agreement between a foreign investor and the state to form a joint venture is completely exempt from the limitation.

Myanmar Energy Statistics 2019 was released in 2019 by the Ministry of Energy and Electricity's corporate organization and the Economic Research Institute for ASEAN and East Asia. The Oil and Gas Planning Department (OGPD) of the Ministry of Electricity and Energy collected data on coal, oil, gas, electricity, and renewable energy from several agencies for the study. The release of that study must be considered a special accomplishment for the civilian government in Myanmar, since

it is challenging to collect information on energy resources. There were no figures provided in the previous administration's reports on the strategic energy sectors, energy strategy, or object direction. International organizations have also addressed the lack of openness in resource information data.

The Myanmar Energy Outlook 2040 research reveals how crucial energy sector reform will be in the coming years. According to that study, the total final energy consumption (TFEC), which includes transportation, commercial structures, and residential buildings, will rise 3.0% year by 2040, a rate far slower than the GDP growth rate. Electricity will rise by 7.0% and oil will rise by 4.9% annually by 2040. However, biomass will barely grow by 0.3% and remain nearly unchanged until 2040. Therefore, biomass will undoubtedly slow the pace of TFEC growth. For the same reason that TFEC will increase, the total primary energy supply (TPES) will grow at a slower rate than GDP, 3.5% per year by 2040.

Coal, oil, gas, hydropower, renewable energy, and biomass make up TPES. Oil is the main fuel that is imported, however by 2040 all fossil fuels will be dependent on imports due to a drop in domestic production of gas, for example. Security of Myanmar's electricity supply will be at risk (Myanmar Energy Outlook 2040, 2020). In 1954, the government and foreign oil companies, such BOC, implemented the first energy sector reform. It was the first instance of a joint venture company being established with IBP, BBP, and BOC. The percentage of shares invested was 54% in BOC, 10% in OBT, 3 % in BBPC, and 33% in government shares. It successfully completed 21 oil wells as a BOC joint venture business in the Bhumi Chai basin in central Myanmar between 1957 and 1961. Production of crude oil was 25.034 million US barrels throughout the nine-year period from 1954 and 1962. However, in 1962, the government decided to nationalize the BOC joint venture company. The three joint venture companies with the government received compensation in the amount of 625 thousand kyats. The second round of those reforms to become state-owned then began. People Oil Industry was added to the company name. Oil refining is one of POI's responsibilities, and the company is also in charge of all sales and distribution efforts for petroleum products. A production department, a department for mining, a department for engineering, and a department for geology and geophysics are all being established at this time by the POI. The required specialists were chosen from a variety of universities and sent to study in nations including Japan, France, the United States,

and Australia. The aim of Myanmar's oil experts is to prove their superiority to foreign businesses.

It was created independently as the Ministry of Energy in 1985. The department of energy planning was expanded during the ministry. It was created independently as the Ministry of Energy in 1985. The department of energy planning was expanded during the ministry. MOGE became the new name for Myanmar Petroleum Corporation in 1989. The country's ruling government welcomed global energy corporations to invest in conformity with the market economy system about 1990. In onshore oil fields in the 1990s, foreign energy corporations formed joint ventures with production-sharing contracts. The 10 blocks of foreign energy companies that were looked for total 10. Onshore oil exploration at the time operated under the guiding assumption that natural gas only existed in the Alphyouke (1) natural gas wells, which could not be exploited for commercial purposes. As a result, several blocks were returned. Regarding the offshore blocks, Yadana block offshore Muttama has been discovered to contain natural mineral reserves by Total E&P.

The state is the owner of all resources, including oil and natural gas, according to Myanmar's 2008 constitution. As a result, the Myanmar Oil and Gas Industry (MOGE) is in charge of setting regulations and overseeing administrative tasks related to the country's oil and gas industry. MOGE presently collaborates with commercial businesses through Production Sharing Contracts (PSC); contracts for Intellectual Property Rights (IPR) and Performance Compensation Contracts (PCC) are also being signed.

The government collaborated with domestic and international energy corporations through a variety of joint ventures from 1996 to 2010. Not only Production Sharing Contracts, but also Improved Oil Recovery (IOR), Exploration & Production (EP), and Rehabilitation Suspended Field (RSF) are examples of production types joint ventures where improvements to the energy industry have been made. The 13 international energy companies that were looking for them during this time come from 13 blocks in the onshore region. Later, during the administration of President Thein Sein, foreign energy corporations were invited to tender once again in accordance with the international tender system, the first time being in 2011 and the second time being in 2014, when a total of 25 businesses won the tender and finished 25 blocks in the onshore area.

According to the Foreign Investment Law of 2012, foreign companies that want to engage in oil and gas exploration and production in Myanmar must form a joint venture with MOGE or a company that is owned by Myanmar citizens. The thriving oil and gas industry reflects the substantial demand for electricity. A total of 154 foreign companies with permission invested more than $22.4 billion in the sector, making up around 30% of all FDI in Myanmar. (Department State, 2021).

Myanmar has energy independent, or does not rely on other nations for its energy needs. The abovementioned policies are in place to encourage energy sufficiency and collaboration and to boost the use of non-fossil fuels for domestic consumption in order to increase the use of renewable energy sources. The energy sector in Myanmar has also been subject to a variety of governments, including colonial governments, socialist governments, military governments, semi-civilian governments, and civilian governments. It has also been overseen by a number of ministries and agencies.

All of those issues are related to weak policies, ineffective administrations, the depletion of natural resources, financial corruption, armed conflict, and institutional flaws that are being looked into. Therefore, an energy policy reform package will always be crucial for the next government.

3.5 Foreign Direct Investment in Oil and Gas Sector

When Myanmar first accepted FDI sources from both domestic and international sources into the sector in 1988, the industry of oil and gas there established modest goals for obtaining FDI. In the beginning of the year, foreign investors responded favorably to the 1988 Foreign Investment Law. Statistics demonstrate that the energy sector has been a key source of FDI entry into Myanmar from the fiscal years 1988–1989 in accordance with the objectives of foreign oil companies and the rules of the Foreign Investment Law of 1988. Offshore areas of Myanmar have seen significant natural gas discoveries. After the reform measures in 2011, foreign investors saw numerous unexplored prospects in Myanmar. According to the Myanmar Investment Commission, the government has a 20-year plan to promote FDI. The main driver of the rise in FDI has been and will continue to be the energy sector, which includes hydropower, oil, and gas. The energy sector has continued to be the most significant magnet for FDI since the new Foreign Investment Law was passed in 2012, when FDI

influx restarted. The Annual Approved Amount of FDI in the Oil and Gas Sector from 2011/12 to 2015/16 is shown in Table (3.1).

Table (3.1) Yearly Approved Amount of Foreign Investment (By Sector) (2011/12 – 2015/16)

US $ Million

No.	Sector	2011-12	2012-13	2013-14	2014-15	2015-16	Total
1	Agricultural		9.65	20.269	39.666	7.18	76.765
2	Livestock & Fisheries		5.6	96.016	26.861	8.25	136.727
3	Mining	19.897	15.334	32.73	6.259	28.923	103.143
4	Manufacturing	32.254	400.716	1823.882	1502.013	1069.846	4828.711
5	Power	4343.978	364.201	46.511	40.11	360.1	5154.9
6	**Oil and Gas**	**247.697**	**309.2**		**3220.306**	**4817.79**	**8594.993**
7	Construction						
8	Transport & Communication	0.634		1190.232	1679.304	1930.966	4801.136
9	Hotel and Tourism		300	435.21	357.949	288.395	1381.554
10	Real Estate			440.573	780.745	728.68	1949.998
11	Industrial Estate					10	10
12	Other Services		14.766	18.534	357.32	235.963	626.583

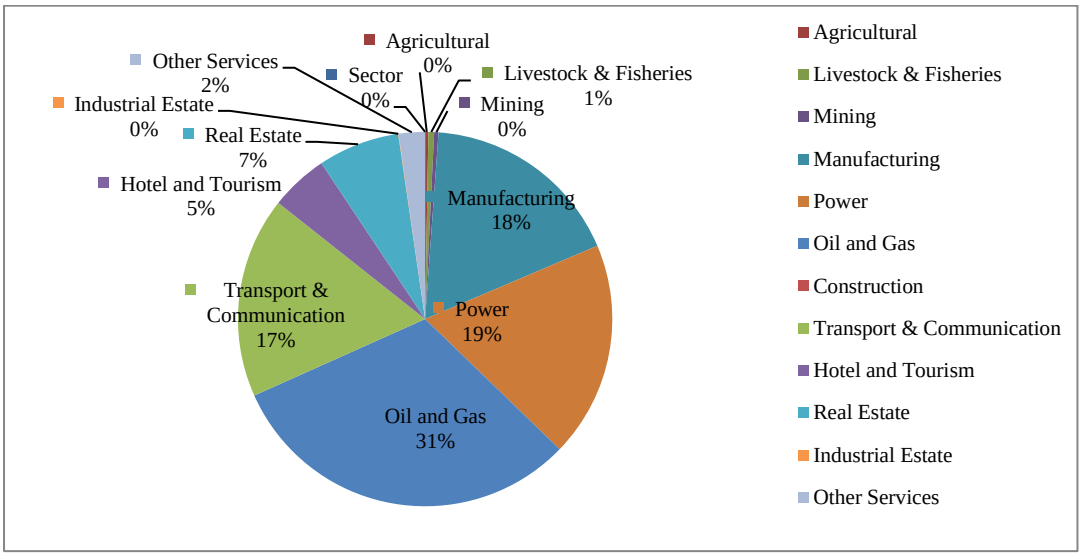
Source: www.dica.gov.mm

The petroleum industry in 2015–2016 attracted the most foreign direct investment (FDI) in Myanmar's history, from USD 3220.306 to USD 4.8 billion, as shown in table (3.1) above (SOD 2019 and dica.gov.mm). The majority of investments were made in the natural gas and oil sector during the five years of the civilian government following 2011, accounting for 31% of all investments, or US$ 8594.99 million out of US$ 27664.51 million. The oil and natural gas industry is asked to apply foreign investment principles at this time by placing blocks through the global tendering system (first time in 2011 and second time 2014).

The sector attracted more than $ 8.5 billion in foreign direct investment (FDI) from 154 permitted foreign enterprises, approximately 30 percent of Myanmar’s total FDI. Out of the 53 onshore oil and gas exploration blocks in Myanmar, 15 companies from 10 foreign countries are participating in 20 of the currently operating blocks. In addition, MOGE has the right to participate as a shareholder of 15% to 25% in oil and natural gas projects, and has been acquired in order to participate in making key

decisions regarding management issues. Also, the state shares received under production sharing agreements are usually only accepted by MOGE.

Figure (3.2) Yearly Approved Amount of Foreign Investment (By Sector) (2011/12 – 2015/16)



Source: www.dica.gov.mm

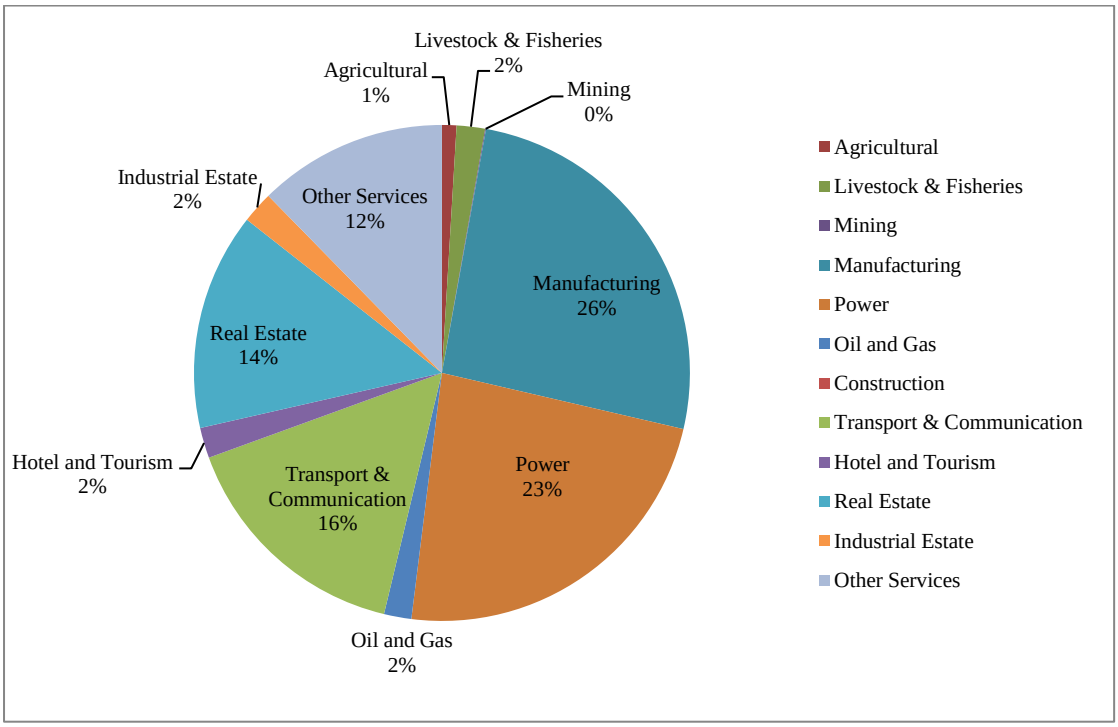
Table (3.2) Yearly Approved Amount of Foreign Investment (By Sector) (2016/17- 2020/21) US $ Million

No.	Sector	2016-17	2017-18	2018 (4 to 9)	2018-19	2019-20	2020-21	Total
1	Agricultural		134.485	10.65	19.119	17.73	9.988	191.972
2	Livestock & Fisheries	96.678	27.661	32.955	156.955	138.488	19.698	375.757
3	Mining		1.31	6		3.8		11.11
4	Manufacturing	1179.514	1769.177	706.677	1347.825	1128.222	286.023	5237.924
5	Power	909.883	405.774	92.68	93.28	1026.89	3121.323	4739.947
6	Oil and Gas				10.204	352.82		363.024
7	Construction							
8	Transport & Communication	3081.149	901.639	314.158	1538.4	300.454	133.5	3188.151
9	Hotel and Tourism	403.646	176.767	9.356	82.622	53.342	81	403.087
10	Real Estate	747.62	1261.977	280.38	210.933	1115.957	8	2877.247
11	Industrial Estate		34.037	34.481	48.451	273.49	28.21	418.669
12	Other Services	231.322	1005.259	277.184	650.742	469.78	103.656	2506.621
	Total	6649.812	5718.086	1764.521	4158.531	4880.973	3791.398	20313.509

Source: www.dica.gov.mm

As shown in table (3.2) above, relatively little was invested in the oil and natural gas sector after the civilian administration assumed power in 2016. Due to the fact that this time period coincides with oil exploration activities being carried out by foreign energy companies, The manufacturing sector's performance during this government was particularly noteworthy, with the electricity industry coming in second. In conclusion, it is evident that governments have given support for fundamental economic sectors a higher priority when it comes to foreign investment since 2011.

Figure (3.3) Yearly Approved Amount of Foreign Investment (By Sector) (20116/17 – 2020/21)



Source: www.dica.gov.mm

According to the following (table 3.3), which provides updated data, foreign investment in Myanmar's oil and gas sector reached $ 22773.392 million by the end of December 2022 (www.dica.gov.mm), comprising nearly 25% of all foreign investment in the nation. As Myanmar gets ready to bid out more of its offshore and onshore blocks for exploration to big oil companies, the amount of foreign investment will rise. As of December 31, 2022, the power sector had the greatest FDI, at 27%. With a share of 25%, foreign direct investment in the oil and gas sector ranks second, and there are currently 76 approved oil and gas projects totaling 22773.392 US dollars in million (12/202, www.dica.gov.mm).

Table (3.3) Yearly Approved Amount of Foreign Investment (By Sector) (1988-2022) US $ Million

No.	Sector	Total (1988-2022)
1	Agricultural	446.881
2	Livestock & Fisheries	943.92
3	Mining	3908.716
4	Manufacturing	13188.409
5	Power	25348.679
6	Oil and Gas	22773.392
7	Construction	102.767
8	Transport & Communication	11429.308
9	Hotel and Tourism	3283.595
10	Real Estate	6670.125
11	Industrial Estate	621.782
12	Other Services	3607.791
	Total	92325.365

Source: www.dica.gov.mm

Foreign direct investment (FDI) influx directly affects foreign exchange reserves and is typically seen as a key driver of economic growth. Theoretically, FDI supports economic growth in the neoclassical growth model by boosting investment volume and/or effectiveness. According to the endogenous growth theory, FDI stimulates economic growth by fostering the transfer of technology from the developed world to the host nation (Borensztein, Gregorio, & Lee, 1998)

CHAPTER IV
THE PRODUCTION AND EXPORT OF OIL AND GAS IN MYANMAR

4.1 Energy Sector’s Share on GDP

The GDP of Myanmar is also significantly influenced by the energy sector. Myanmar's political reforms are being accompanied by a considerable increase in the importance of the energy sector. The energy sector contributed only 0.3 percent (Kyat 0.7 trillion) of the GDP in 2010 and 4.7 percent in 2011. (Kyat 2.24 trillion). 5.4 percent (Kyat 2.75 trillion) was received in 2012, followed by 5.2 percent (Kyat 2.92 trillion), 6.3 percent (Kyat 4.01 trillion), 5.1 percent (Kyat 3.69 trillion), 3.4 percent (Kyat 2.67 trillion), 3.8 percent (Kyat 2.42 trillion), 5.3 percent (Kyat 3.56 trillion), and 6 percent (Kyat 4.69 trillion) in 2018, respectively (statistical, 2020).

Although there is a correlation between energy use and GDP that is positive, energy intensity, which is typically lower in rich nations, has decreased over time (Stern, 2018). When a country has advanced IT, increasing consumption, and increased manufacturing, which is prosperity of developing countries, those factors contribute to the expansion of the country's GDP. According to the most recent annual report, the contribution of the energy sector to GDP in 2010–2011 was only 0.2% (Kyat 66994 Million), and in 2015–16 it was 5.1 percent (Kyat 3687516.1 Million), in 2016–17 (P.A) it was 3.4 percent (Kyat 2669961.3 Million), and in 2017–18 (end of Mar), 3.8 percent (Kyat 3563702.1 Million), and in 2018–19 (end of Sep), 4.4 percent (CSO, 2020).

As a result of the International Organization, Myanmar has maintained its position as the region's most economically developed nation. The International Monetary Fund (IMF) forecasts that this rate would remain over 7% at least through the mid-2020s. The Asian Development Bank's Energy Master Plan estimated the GDP growth rate at 7.1% through 2030 (ADB, 2015). (IMF, 2018). Figure (4.1) depicts the sector's contribution to GDP at current prices.

The Economic Research Institute for ASEAN and East Asia previously produced an energy projection, and according to this analysis, the average GDP growth rate during the study period was 6.8%. (ERIA, 2018). For example, it is predicted that growth will reach 6.3% in the years 2020–2030 and 5.0% in the years 2030–2040. (Myanmar Energy Master Plan, 2015). According to the current forecasting guidelines used by international organizations for GDP growth, the Myanmar government must be able to accurately predict the demand for energy-related fuels in the foreseeable future. For this study, the Gross Domestic Product (GDP) contribution of the energy sectors is also crucial.

Table (4.1) Contribution of Energy Sector in GDP at Current Prices

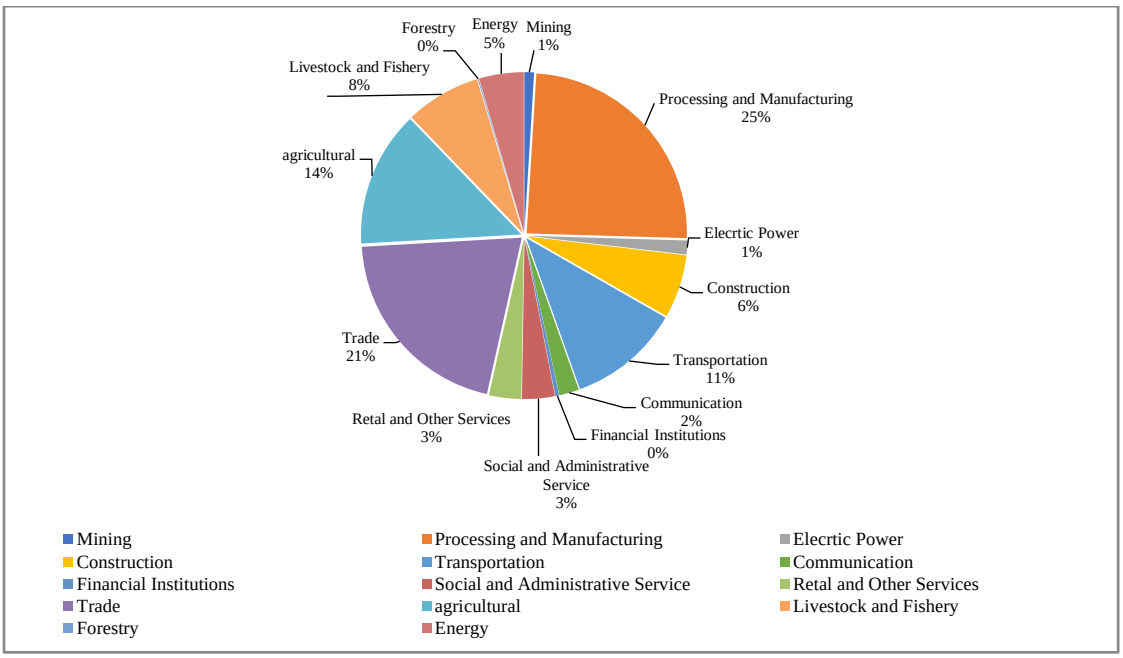
Year	GDP (Million Kyat)	Energy Sector Contribution in GDP (Million Kyats)	Energy Sector Contribution in GDP (in percentage)
2000-01	2,552,732.30	4,838.50	0.19
2001-02	3,548,472.20	5,389.70	0.15
2002-03	5,625,254.70	7,539.50	0.13
2003-04	7,716,616.20	8,607.60	0.11
2004-05	9,078,928.50	10,852.30	0.12
2005-06	12,286,765.40	20,075.70	0.16
2006-07	16,852,757.80	29,719.20	0.18
2007-08	23,336,112.70	48,159.00	0.21
2008-09	29,233,288.00	62,436.80	0.21
2009-2010	33,894,039.10	72,445.90	0.21
2010-11	39,776,764.90	66,994.90	0.17
2011-12	46,307,887.70	2,241,424.30	4.84
2012-13	51,259,260.00	2,745,827.80	5.35
2013-14	58,011,626.00	2,919,975.00	5.03
2014-15	65,262,092.50	4,011,384.20	6.14
2015-16	72,780,464.50	3,687,504.40	5.07
2016-17	79,760,049.50	2,669,961.30	3.4
2017-18	90,450,949.10	3,422,785.00	3.8
2018-19	105,258,500.80	4,6866,268.30	4.4,
2019-2020	112,773,996.6	4,267,419.1	3.8

Source: Central Statistical Organization (CSO) 2021

Table (4.1) shows that the energy sector's contribution to GDP climbed dramatically in the years after Yetagun Offshore Gas Production began, but has since somewhat dropped due to a minor decline in global energy prices through 2019. As exports rose to almost the same level as GDP, the energy sector's demand increased to support economic growth. As demand rose, so did the energy sector's revenue. Due to low harvests and uncertainty over the new government's policies, the GDP only expanded by 5.9% in 2016–17. The GDP growth rate for Myanmar was 6.7% in fy2017/18, up from 2017.

The government has updated its economic development policy to reduce the number of state-owned businesses and promote the growth of the private sector in an effort to liberalize the economy. In August 2018, the new company legislation went into effect, liberalizing industries like import and export, insurance, and the securities and exchange market that had previously imposed restrictions on foreign investment. (Meijuan Li and Qiming Tang, 2021).

Figure (4.1) Myanmar's GDP Share of Sector, 2018-2019 (End of Sept) at Current Price



Source: Central Statistical Organization (CSO) 2020

Since 2013, the Energy Sector has contributed significantly more to GDP due to the new gas fields of the Shwe Project and Zawtika Project, which began producing and exporting gas in 2013 and 2014, respectively. With 6.14% of the overall GDP in 2013–14, the energy sector's contribution to GDP was the highest at 4,011.431 million

kyats. as that year is when the new offshore blocks are given. Although there was considerable production of oil and natural gas throughout the years 2016–17, 2017–18, and 2018–19, the income may have been modest due to the drop in worldwide fuel prices.

4.2 Oil and Natural Gas Fields in Myanmar

In Myanmar, there are two sedimentary geo-basins capable of storing oil and natural gas, the offshore sedimentary basin and the inland sedimentary basin. These sedimentary basins are classified as follows depending on the geographical position.

Offshore sedimentary basins are:

(1) Rakhine Offshore Sedimentary basin
(2) Mutattama offshore sedimentary basin
(3) Taninthari offshore sedimentary basin

Onshore sedimentary basins are:

(1) Rakhine Costal Basin
(2) Hukoung Basin
(3) Chindwin Basin
(4) Shweboo-Monywa Basin
(5) Central Basin
(6) Pyay Embayment
(7) Ayayarwady delta Basin
(8) Pegu Yoma Basin
(9) Sittaung Yalley Basin
(10) Ma Pale Basin
(11) Mawlamyine Basin
(12) Nam Myaw basin
(13) Thibaw-Lasho Basin
(14) Kalaw Basin

These sedimentary basins include the Maubin, Nyaungton, and Aphouke oil and gas fields, which continue to produce oil and natural gas. The other three offshore sedimentary basins are still being explored and produced by domestic and foreign oil and gas corporations. Regarding the oil and gas blocks in Myanmar, production of the oil and gas blocks is dependent upon the search procedure. (See Appendix 1)

The primary oil fields before 1962 were the PayarGone-Kyaitlat Natural Gas, the Yenaungchaung Oil Field, the Ayadaw Oil Field, and the Chauk Lanyar Oil Field. Myang Aung Oil Field, Pyay Oil Field, Shwe Pythar Oil Field, Mann Oil Field, Letpanto Oil Field, Patpal Oil Field, Taungshapin Oil Field, Htan Ta Bin Oil Field, Tetma Oil Field, Kaung Nee Oil Field, Kyaugya Oil Field, Tha Gyi Taung Oil Field, Maupin (South) Oil Field, Aphyout Natural Gas Field, Nyangtong Natural Gas Land, and Pyilo Natural Gas Fields.

In Myanmar, there are 51 offshore oil and natural gas blocks and 53 onshore oil and gas blocks. Some of the blocks have already been investigated; others are manufacturing enterprises like partnerships with international firms, domestic oil businesses, or the MOGE that is in control. The U Thein Sein government encouraged multinational energy businesses to tender through the international standard tender system in 2011 and 2013, in conformity with the country's shifting political and economic freedoms.

Through the international tendering process, 25 local and foreign energy corporations successfully bid for 25 onshore blocks between 2011 and 2013. Some of these blocks are at the exploration and production stage, while others have simply reached the level. Some of these blocks have also been given back to the government.

1.	Mann Oilfield	MPRL E&P (Myanmar Based)
2.	Khayan Oil Field and Yanaung Chaung Oil Field	Goldpetrol Company
3.	Shwe Bo-Mongywa Oil Field	CNOOC (China Based)
4.	Mahu Taung Oil Field	SINOPEC (China Based)
5.	Sisava	ESSAR Company (India Based)
6.	Hugound and Uru region	Nobel Oil Company (Britain Based)
7.	Ng Hlaing Deng Oil Field	NPCC Company (Based UAE)
8.	Karen State’s Mangpali Region	SNOG and MOGE Joint Venture

As a result of the deal, MOGE received the records of the measurements and the blocks' searches. A total of 15 companies from 10 different nations are involved in 20 of the 53 onshore oil and gas exploration blocks in Myanmar that are currently active. [Appendix (2)]

The MOGE intended to increase drilling and natural gas exploration along the Chindin and Rakhine rivers. Hugong Valley area has been the site of test excavations,

as have those in the Shwebo-Mongywa and Bago Yoma regions. It is intended to investigate the natural gas reserves in the Thipao-Lasho region, the Mawlamyine region, the Monpali region, the Myla region, the Kalo region, and the Sittaung River region. The Onshore Oil and Gas Map after 2007 looks like this: An international procurement for offshore blocks was organized in 2014–15, and more than 20 blocks were agreed upon. Deep water (25) and shallow water (26) out of a total of 51 offshore blocks, respectively. Foreign enterprises make up the seventh and the eighteenth, both of which are in deep water.

Table (4.2) List of Offshore Company

1	A.1	Daewoo Company
2	A.3, AD.7	Daewoo Company
3	A.2, A.5, A.7	ESSAR Company
4	A.6	MPRL
5	AD.1, AD.6, AD.8	CNPC (China National Protroleum Company)
6	M1	Rimbunan Company
7	M2	Petro Vietnam
8	M3, M4, M9, M11	PTTEP
9	M5, M6	Total E&P
10	M10	CNOCC
11	M12, M13, M14, MD4	PCML
12	MD5, MD6, M14	PCOSB
13	M15, M16	KMDC/BOC Company

Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

4.2.1 Current Production of Natural Gas Fields in Myanmar

The capacity of Myanmar's offshore and onshore natural gas exploration blocks to produce natural gas was 460,512,44,000,000 cubic feet in 2011, 462,493,90,000,000 cubic feet in 2012, 479,243,17,000,000 cubic feet in 2013, 609,504,62,000,000 cubic feet in 2014, 708,145,64,000,000 cubic feet in 2015, 674,257,86,000,000 cubic feet in 2016, 658,834,000,000,000 cubic feet in 2017, 627,774,44,000,000 cubic feet in 2018, and 680,87 The amount of cubic feet generated in 2020 and 2021 was 645,229.86 million and 624,240.19 million, respectively.

Table (4.3) Total Gas Production Capacity from Offshore and Onshore (MMSCF)

Year	(MMSCF)
2011	460,512.44
2012	462,493.90
2013	479,243.17
2014	609,504.62
2015	708,145.64
2016	674,257.86
2017	658,834.05
2018	627,774.44
2019	680,874.45
2020	645,229.86
2021	624,240.19

Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

Myanmar's capacity to produce natural gas is rising year after year, according to Table (4.3). Although onshore natural gas output has decreased, offshore blocks have generated more since 2010. Natural gas output peaked in 2015 at 708,145.64 bcf/d, up from 460,512.44 bcf/d in 2011. Due to the output of the Yadana project and the Yetagun project, which reached approximately thirty years of age, there was a modest decline from 2016 to 2018. However, the production output has somewhat grown as a result of the Shwe natural gas block's extension.

According to MOGE 2022, 10,403,771.42 million cubic feet of natural gas were generated over the mentioned (10) year. Because the updated data obtained in around ten years will be able to forecast the future of Myanmar's energy, the principles of onshore and offshore natural gas production are presented in the presentation of the figures. Since 1989, Myanmar has awarded the offshore oil and gas exploration fields on a production-sharing basis.

There are four large offshore natural gas reserves in Myanmar (Yadana, Yetagun, Zawtika, and Shwe), with Yadana being the largest. More than 90% of the nation's total output of natural gas comes from the country's existing offshore fields. Yetagun, the second-largest gas field in Myanmar, was found in 1992, and production started in 2000. It started producing in 2014, making it the most recent Zawtika offshore gas field. The remaining one-third was supplied to the domestic market, while the

remaining two-thirds were shipped to Thailand through pipeline. The Shwe field, which began operations in 2013, is the only producing mid-northern offshore field. A pipeline was used to ship 80% of the production to China, with the other 20% going to the domestic market.

There are 51 blocks that make up offshore areas, 18 of which are active, and 24 of which are designated as deep sea. The Yadana Project, Yetagon Project, Shwe Project (which exports gas to China), and Zawtika Project are the current main offshore gas developments; 75% of production is exported to Thailand and China. There are 2,200 miles of natural gas pipeline throughout the nation. Over 27,000 CNG vehicles and 45 CNG filling stations can be found in Burma. The daily home natural gas supply averages 300 Mcf. (SOD, 2019).

In 2011, Myanmar's offshore natural gas exploration blocks had a total production capacity of 437,033.10 million cubic feet; this capacity increased to 439,363.90 million cubic feet in 2012; 457,045.77 million cubic feet in 2013; 589,366.72 million cubic feet in 2014; 689,105.14 million cubic feet in 2015; 657,214.54 million cubic feet in 2016; 640,446.51 million cubic feet in 2017; 609,467,03 million cubic In 2020, 630,154,03 million cubic feet were generated, and in 2021, 613,690,99 million cubic feet.

Table (4.4) Yearly Gas Production by Gas Fields (MMSCF)

Year	Yadana	Annal Growth rate (%)	Yetagun	Annal Growth rate (%)	Shwe	Annal Growth rate (%)	Zawtika	Annal Growth rate (%)
1998	3211.47	-	-	-	-	-	-	-
1999	2247.16	-30.0	542	-	-	-	-	-
2000	66148.42	2843.6	15619.05	2781.7	-	-	-	-
2001	196593.13	197.2	44248.52	183.3	-	-	-	-
2002	224410.77	14.1	75609.17	70.9	-	-	-	-
2003	224994.29	0.3	104518.45	38.2	-	-	-	-
2004	239725.16	6.5	109533.58	4.8	-	-	-	-
2005	237943.08	-0.7	160749.42	46.8	-	-	-	-
2006	249310.20	4.8	157294.68	-2.1	-	-	-	-
2007	277964.63	11.5	164273.67	4.4	-	-	-	-
2008	258412.37	-7.0	150199.22	-8.6	-	-	-	-
2009	235531.21	-8.9	148634.60	-1.0	-	-	-	-

Table (4.4) Yearly Gas Production by Gas Fields (MMSCF) (Continued)

Year	Yadana	Annal Growth rate (%)	Yetagun	Annal Growth rate (%)	Shwe	Annal Growth rate (%)	Zawtika	Annal Growth rate (%)
2010	265962.78	12.9	158983.33	7.0	-	-	-	-
2011	284520.49	7.0	152512.61	-4.1	-	-	-	-
2012	285926.69	0.5	153437.22	0.6	-	-	-	-
2013	281373.09	-1.6	155485.38	1.3	20177.3	-	-	-
2014	279708.50	-0.6	133995.90	-13.8	119330.69	491.4	56331.63	-
2015	281109.06	0.5	111676.93	-16.7	178034.37	49.2	118284.78	110.0
2016	276748.46	-1.6	90904.67	-18.6	174528.17	-2.0	115033.24	-2.7
2017	275423.79	-0.5	85615.78	-5.8	165706.65	-5.1	113700.29	-1.2
2018	291052.43	5.7	59099.93	-31.0	146528.35	-11.6	112786.32	-0.8
2019	289798.92	-0.4	42428.58	-28.2	218770.44	49.3	111899.02	-0.8
2020	284641.95	-1.8	23577.65	-44.4	202382.87	-7.5	119551.56	6.8
2021	287346.75	1.0	9226.63	-60.9	197282.17	-2.5	119835.46	0.2

Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

According to Table (4.4), the Yadana Project began production in 1998 and has since produced 3211.47. (MMSCF). The 14 draw wells of the Yadana gas project, a type of gas deposit found in the limestone layer, are producing gas in accordance with the Field Development Plan (FDP). When compared to other offshore blocks in the nation, the Yadana offshore block had the most consistent output from 1998 to 2021. After 6 years of Yadana project production, the project's production of 277964.63 (MMSCF) dramatically increased in 2005 as a result of the discovery of the Sein gas block, which was added 7 miles distant from the Yadanar gas deposit field. In order to increase gas output, the Yadan Project constructed a new high-pressure platform in 2007.

There was more natural gas in 2005. 5600104.8 million cubic feet of natural gas were generated by the Yadana project between 1998 and 2021, according to a table made public by MOGE. It is anticipated that the Yadana Project Field will continue to generate natural gas through 2026 at its current daily rate of 850 million cubic meters. The best and most reliable producing field in terms of size and stability is the Yadana gas field. To describe how the Yadana Gas Project considerably produced MMSCF 66148.41 in 2001, after Yadana Gas began production, a summary of the production process was made. Despite a modest decline in 2005, it nearly maintained the original

production principle. The average production between 2000 and 2007 was about 200,000 million cubic meters. Pipe accidents caused a modest decrease in production in 2008 and 2009, but it was still higher than the starting production.

Yethagun stands out because it doesn't have a domestic sales strategy. Natural resource production reached 15619.05 million cubic feet in the second year, which is significantly less than the Yadana Gas Project's production volume. Since starting to produce 542 million cubic feet of natural gas in 1999, Yethagun's natural gas production rate has steadily and dramatically increased, reaching 155485.4 542 million cubic feet of natural gas in 2013. After 2016, the Yetagun project's production volume dropped from 111676.93 (MMSCF) to 90,904.67. (MMSCF). Since 2016, there has been a notable decline in the amount of natural resources that can be exploited due to the lengthy manufacturing cycle. Up until 2021, production has marginally dropped. More than 22 years have passed since the construction of the flag block. According to a review of Yetagun gas production, the amount of gas produced climbed steadily to more than 5,000 throughout the first three years of production. Up to 20014, the production remained consistent and stable, starting in 2003 at 104518.45 and increasing. Production has sharply decreased since 2015. The production level is at its lowest point ever in 2021.

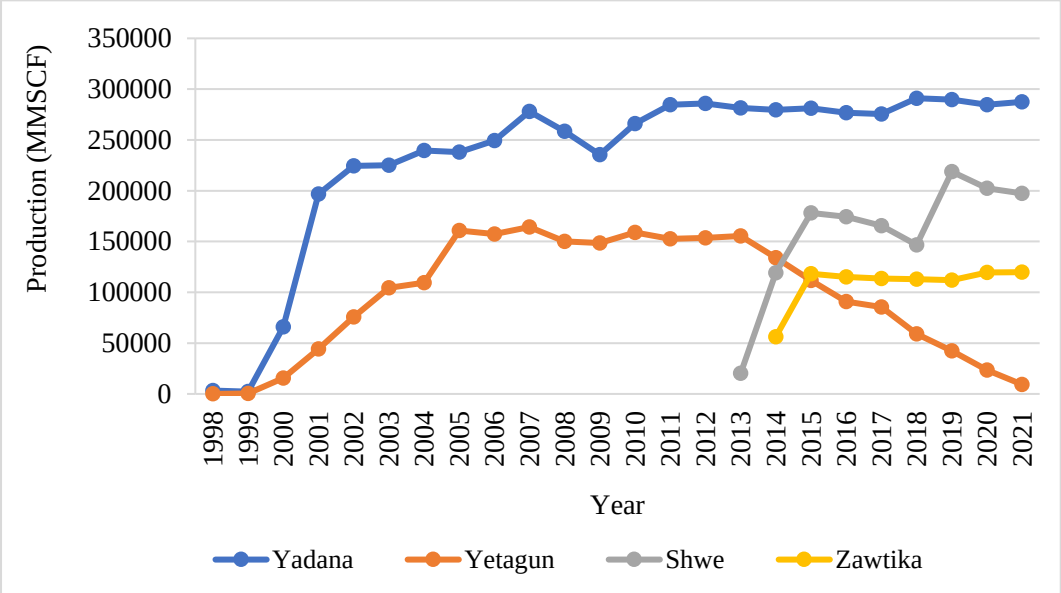
Off the coast of Rakhine, more than 40 nautical miles from the city of Kyawphyu, is where the Shwe gas project, which began in 2013, is situated. The production process is overseen by Korea's Daewoo Company, which purchases the natural gas generated in China. 2013 saw the beginning of the first production using resources totaling 20177.3 million cubic feet. 336.11 million cubic feet of natural resources were acquired for domestic consumption in the first year of production. The Shwe block is unique in that its natural resources dramatically expanded to 119330.69 million cubic feet in the second year. The production of natural gas has been steadily rising since 2014. A total of 1422741.01 million cubic feet of natural gas were produced from the Shwe gas project, which began in 2013, until 2021. The natural gas used in Shwe has a heat capacity of roughly 1000 BTU, but the gas price is higher and it is very profitable. The second stage of development is scheduled to begin in 2018 and there are numerous additional natural reserves nearby. The Shwe gas project, which is the development of Myanmar's natural resources, also has a lot of promise.

Zaw Tika Gas Fields is the most recent offshore block to begin producing natural gas. This project, which is located off the coast of Muttama, is a joint venture

with Thailand's PTTEP, MOGE, and PSC agreement. In 2014, with 56331.63 million cubic feet of natural resources, the first production started. The Zaw Tika Block, which was the first to be created, has the highest proportion of natural resources available for consumption in Myanmar at 16,755.56 million cubic feet. Natural resource output has so far resulted in an annual production rate of 867422.33 million cubic feet, while domestic consumption has reached 194588.29 million cubic feet.

The Zawtika block has a different geological setting than other deposits. Since the thin shallow sand ridge was extracted, the gas reservoir is dispersed and is found in a field. That makes it difficult to forecast both the underground position and future production. In conclusion, Zawtika block discovered that the production life is under 10 years and the production volume is constant at more than 110,000 MMSCF.

Figure (4.2) Yearly Gas Production by Gas Fields (MMSCF)



Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

Yadanar Natural Gas Project. The Yadana natural gas project in Kapali Bay started producing commercially in 2000, and over the course of 30 years, it is anticipated to produce more than 5.3 trillion cubic feet (150 billion cubic meters) of natural gas. Currently, this block produces 770 million cubic feet of natural gas per day. 2014 saw the discovery of the Ruby natural gas project in the area of the Yadana gas deposit. Natural gas has been generated commercially since 2017 and is thought to be present in natural gas reserves in the amount of roughly 8 billion cubic feet.

Yetagun Natural Gas Project. Additionally, the project includes a 24,130 square kilometer offshore gas resource in the Kapali Sea. The estimated 3 trillion cubic feet of natural gas and 80 million barrels of oil in the gas reserves may start being exported and sold as early as May 2000, and production would likely last until 2030.

Zotika Natural Gas Project. The project size is 11,746 square kilometers, and it is situated in the Gulf of Muttama. This project has been producing natural gas since 2014, and every day 240 million cubic feet of natural gas are exported and sold.

Shwe Natural Gas Project. The offshore blocks Shwe Phyu and Mya are a part of this project and are situated in Blocks A1 and A3 in the Bay of Bengal. The Mya block of the project's natural gas was found in July 2013, and commercial production started in August. The block may have 4.53 trillion cubic feet of natural gas reserves, with a daily production of 608 million cubic feet. (Appendix -4)

Onshore Oil and Natural Gas Fields; Myanmar's onshore natural gas fields produce 5,700 barrels of crude oil and 49 million cubic feet of natural gas a day, with 30 million of those produced in the Maupin region, making up roughly 60% of the country's total production. In addition, the majority of the onshore blocks currently in operation are in Myanmar's middle and lower regions. As a result of expanded natural gas exploration in other locations, natural gas output may rise further in the years to come.

Myanmar's onshore natural gas exploration blocks have a total production capacity of 23,479.34 million cubic feet in 2011, 23,129.99 million cubic feet in 2012, 22,207.41 million cubic feet in 2013, 20,137.90 million cubic feet in 2014, 19,040.49 million cubic feet in 2015, 17,043.32 million cubic feet in 2016, 18,387.54 million cubic feet in 2017, 18,307.41 million cubic feet in 2018, 17,977.49 million cubic feet in 2019, and 15,075.83 million cubic feet in 2020. The output from onshore oil and natural gas blocks after 2011 is shown in the Table (4.5).

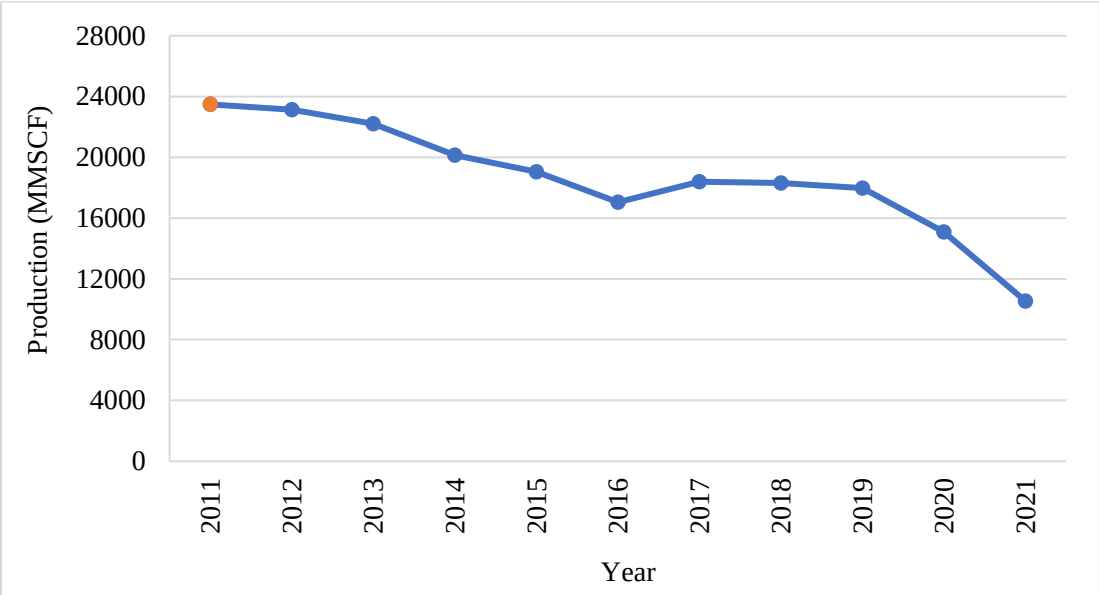
Table (4.5) Onshore Gas Production from 2011 to 2021

Year	Production (MMSCF)
2011	23479.34
2012	23129.99
2013	22204.41
2014	20137.91
2015	19040.49
2016	17043.32
2017	18387.54
2018	18307.41
2019	17977.49
2020	15075.83
2021	10540.21

Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

The majority of Myanmar's onshore oil and natural gas blocks are experiencing a continual reduction in production, as seen in Table (4.5). There was still decaling and no significant natural gas reserves for commercial production, despite frequent dealings with major foreign energy corporations regarding onshore extraction and research to improve production.

Figure (4.3) Onshore Gas Production from 2011 to 2021



Source: Department, MOGE and Available Sources

In addition, Myanmar is also discovering and producing inland oil and natural gas fields as follows:

(a) Nyangtong natural gas field. Nyangton natural gas field is located in Nyangton Township, about 55 kilometers northwest of Yangon. One of the greatest onshore gas deposits, the gas field was discovered in 1999 and possesses 297 billion cubic feet of natural gas. 660 barrels of oil and 87 million cubic feet of natural gas are produced daily by the gas well.

(b) Aleida natural gas field. The gas well was found for the first time in 1991, and it is situated halfway between Tayi Kyi and Zalon City. There may be 483 million cubic feet of natural gas in this gas deposit, and 9 million cubic feet of natural gas are generated daily from it.

(c) Shwe Pytha Oil and Natural Gas Land. This gas well, which is situated near Myan Aung City in the Irrawaddy Region, was found by MOGE in 1967. 372 barrels of oil and 0.290 million cubic feet of natural gas are produced daily by this gas well.

(d) Yenzun Chaung Oilfield. There may be 540 million barrels of oil reserves in this field, which was first discovered in 1887 and is situated in the town of Keru Choi in the Magway Region. A daily average of 1,810 barrels of oil are being produced by the well.

(e) Myan Aung oil field. The My Aung town of the Irrawaddy area is home to this oil field, which was first discovered in 1964. 51 barrels of oil and 0.274 million cubic feet of natural gas are produced daily by the oil field.

(f) Red Bank oil and natural gas land. This oil field was discovered in 1985 and is situated in the Minbu and Sku townships of the Magway Region. It generates 1,934 barrels of oil and 1.9 million cubic feet of natural gas daily.

(g) Taungshapin oil field. It was found in 1978, and it is situated in Minbu Township. There will be 157.3 million barrels of oil, or 607 barrels a day, according to estimates from the oil well.

(h) Canyon-way village oil field. This oil field was discovered in 1997 and is situated in Kyang Township. It has an estimated 400 million barrels of oil and natural gas and produces 541 barrels of oil per day.

(i) Stone cup-Lampanto-Shertu oil field. It was discovered in 1997 and produces 668 barrels per day in Pau Township, Magway Region. Natural gas output and oil reserves total 76.7 million barrels.

(j) Thagyi Taung-Jassip Oil and Natural Gas Land. It was discovered in Po Township and produces 439 barrels of oil and 16.33 million cubic feet of natural gas per day.

(k) Mann oil field. The oil field was discovered in 1970, and it is situated northwest of Magway. 234 of the more than 660 oil wells that have been dug are still in operation. There may be 433 million barrels of oil reserves and 2,268 barrels of oil will likely be produced per day from this oil field.

(l) Payi Hill Oil Field. It was discovered in 1964, is situated in Shwetaung Township, and produces 201 barrels of oil per day. 49.7 million barrels of oil are thought to be in the reserves.

3,480,552 million cubic feet of natural gas were produced in 2020 from the Samjep-Thagyi Taung oil fields, which included the Mann Oil Field, Taungshapin Oil Field, Red Bank Oil Field, Canyon Oil Field, and Stone Cup-Papanto-Etato Oil Land. Two export pipelines, one domestic pipeline network, and a 210 km long pipeline to Thailand have all been constructed as natural gas pipelines. A 793 kilometer pipeline is used to export it to China as well. A total of 2,100 miles of domestic pipelines, ranging in size from 6 inches to 24 inches, have been constructed.

4.2.2 Natural Gas Consumption in Myanmar

The country's current oil and gas production falls short of supplying its needs, but under contracts with developers, significant amounts of natural gas are transferred to nearby nations like Thailand and China. In 2021-2022, the government expects that the state-owned Myanma Oil and Gas Enterprise (MOGE) will make around $1.5 billion from oil and gas projects, with natural gas income accounting for half of Burma's foreign exchange earnings (State of Department, 2017). Myanmar consumes 0.1% of the 132,290,211 MMcf of natural gas that is consumed globally, placing it at number 64. (State of Department, 2017).

The Ministry of Electricity and Energy reported in 2019 that domestic natural gas consumption reached 518 million cubic feet per day in 2020, with 469 million cubic feet coming from the electricity generation sector, 18 million cubic feet from the transportation sector, and 30.2 million cubic feet from the industrial and other sector. Since 2010, more natural gas has actually been used in the electricity generation sector, which has led to an increase in home natural gas consumption.

Only 18% of domestic energy demand is met by natural gas, according to surveys from 2016. Myanmar used natural gas for domestic purposes in homes up to the 1970s. Since 1971, domestic production gas has only been used in oil fields and nearby natural gas power plants. They are now used more widely as fertilizer production inputs and as CNG and LPG fuel for vehicles. CNG stations, fertilizer factories, cement factories, and other sectors use natural gas obtained from offshore blocks in their operations.

4.2.3 Natural Gas Consumption by Region / State

The region includes Yangon, Mandalay, Ayayarwaddy, Magway, Bago, Thnintharyi, and Union Terrorism of Nay Pyi Daw may access it as well as Rakhine State, Mon State, and Karen State, which can use locally produced natural gas. The majority of the natural gas utilized in the Yangon region—90%—is for the production of power, with the remaining 10% going to the transportation, industrial, and residential sectors. About 49.7% of domestic natural gas usage is used in the Yangon Region. The Mandalay Region consumes natural gas at a second-place level. Approximately 80% came from the sector that produces power, with the remaining 20% going to other industrial, household, and transportation sectors**.** Unfortunately, despite Mandalay being the second-most populous city, the connection pipeline has not yet been established with a natural gas pipeline. Since household gas consumption only accounts for 13.9% of domestic natural gas consumption, it is not yet widely used. Mon State, the third-largest user of natural gas, has natural gas blocks that are in accordance with its position. Natural gas consumption is high due to the state's good access to gas pipelines, yet only 8.3% of domestic natural gas consumption is utilised.

According to the MOGE, which is responsible for the gas sector, the Irrawaddy Region accounts for 4% of domestic natural gas consumption, followed by the Magway Region with 3.8%, Rakhine State with 3.5%, Bago Region with 1.6%, Karen State with 0.8%, Tanintharyi Region with 0.4%, and Nay Pyi Taw with 0.1%, respectively. The Magway Region's natural gas is transformed into CNG gas and mostly used in the transport sector.

4.2.4 Natural Gas Consumption by Business Sectors

According to the MOGE report, the power generation sector uses the most natural gas among business areas. Since 2010, the demand for natural gas has gradually

expanded in the power production sector, which now accounts for 3/4 of domestic gas consumption. The largest source of electricity in Myanmar is generated by hydropower, but the use of natural gas power stations has increased as a result of factors such local opposition to the development of new plants and a lack of available land for new production facilities.

The use of natural gas in Myanmar's electricity production increased from 493 ktoe in 2011 to 2,653 ktoe in 2016, although it is unknown how much will be produced in 2022. According to information publicly released by MOGE, the percentage of electricity produced by natural gas-fired power plants increased from only 23% of all electricity produced in 2010 to 45% by 2016. The demand for natural gas will rise from 531 million cubic feet in 2021 to 887 million cubic feet in 2030 for both new and existing natural gas-fired power plants (IAEA, 2021).

The transportation sector is the second largest user of natural gas and uses the transportation sector is the second largest user of natural gas and uses 49 million cubic feet of natural gas per day. The conversion of diesel vehicles to natural gas vehicles (NGV) was started in 1986. Currently, there are 46 (46) CNG gas shops in Myanmar and these shops are sold by the vehicle natural gas department of the Myanmar Oil and Natural Gas Industry.

The third-largest consumer of natural gas is the industrial sector, which accounts for 5% of all domestic natural gas consumption and is mostly utilized to produce fertilizer. Three of the five (5) operating fertilizer plants under the supervision of the Ministry of Electricity and Energy used approximately 14 million cubic feet of natural gas daily as raw materials in 2019. Natural gas is also utilized as energy in oil refineries and liquefied petroleum gas plants, which in 2019 consumed 3.6 million cubic feet of natural gas day. 14 percent of the total domestic natural gas consumption is accounted by other onshore and offshore natural gas exploration and mining activities. Private industrial zones consumed 39 million cubic feet of natural gas per day in 2016 and 2017, and 33 million cubic feet in 2018. This includes the industrial zones of Yangon and Mandalay. According to the MOGE statistical reports, 28.3 million cubic feet of the industry zone were used in 2018.

From the fiscal years 2010–2011 to 2018–2019, the electricity generating, industrial, and transportation sectors accounted for the majority of domestic natural gas use. The average annual consumption has therefore increased by 9.3 percent. The power production sector used 121,748 million cubic feet of natural gas, which is 87 percent of

the total amount consumed during the fiscal year 2018–2019. The general industrial sector used 10,549 million cubic feet of natural gas, which represents 7 percent of the total amount consumed. As a result, the natural gas demand for the electricity generation industry might rise from 531 million cubic feet in 2021 to 887 million cubic feet in 2030.

Natural gas was not used as residential gas up until 2017, and it was found that electricity and biomass were the major sources of residential energy use. Liquefied petroleum gas (LPG) is the only energy source used for residential uses in large cities like Mandalay and Yangon. Power, industry, transportation, cooking, and other domestic uses for gas are included. According to onshore gas consumption, the biggest utilization is for raw materials (33.31%), followed by power (29%). With only 1.59%, industry is the least utilised.

Economic development is promoted by successful industrial zone development. It is sufficient to notice that the success of industrial production depends on the power sector, and that natural gas is being used more and more in the production of electricity. According to offshore gas use, transportation comes in second place with 1.73% and electricity consumption ranks first with 97.27%. It only uses 0.02% of raw materials. Future natural gas resource requirements will be determined by the demands of industrialization and economic expansion. Due to this requirement and the existing environment, the principles of onshore and offshore natural gas production must be taken into account as shown in the Table (4.6).

Table (4.6) Onshore and Offshore Gas Consumption (2021 April to 2022 March)

Particular	Onshore		Offshore	
	MMSCF	%	MMSCF	%
Power	2781.9136	29.00	122767.475	97.27
Industry	152.7181	1.59	250.1941	0.20
Raw	3195.5249	33.31	23.829	0.02
Transportation	2299.2299	23.97	2179.5046	1.73
Cooking and Other	1164.7207	12.14	992.2321	0.79
Total	**9594.1072**		**126213.234**	

Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

Table(4.6) shows that the machinery industry uses onshore natural gas the least. The electrical industry uses 97 percent of the natural gas produced in the offshore

blocks, while the remaining sectors account for less than 3 percent. In actuality, the offshore natural gas block produces the most natural gas, however it is unfortunate that there isn't a chance to use it to expand other economic sectors. One and a third of the offshore natural gas output, or 9594.1072 million cubic feet, is produced domestically. The offshore and onshore natural gas output shown in the above table suggests that there is a need to employ offshore natural resources for other economic sectors.

4.2.5 Comparing of the Offshore Natural Gas Production and Domestic Consumption

Offshore natural gas production is one industry that brings in billions of US dollars annually for the nation. Due to the open economic system, offshore natural gas production was started after 1990. In the blocks M5 and M6, where the Myanmar oil experts were found in the 1980s in the Mottama Sea off the coast, the French state-owned Total EP Oil Company had conducted new exploration. Since that time, Myanmar has undoubtedly begun to receive a sizable amount of foreign income. The further exploration for natural gas for Myanmar's three coasts was carried out by other foreign energy corporations.

It was discovered that there is a significant gap between Myanmar's domestic consumption and natural gas output when this ratio was examined. The amount of domestic procurement and consumption is far too low, despite the establishment of joint ventures with several contracts, including PSC and major foreign energy corporations. The Yetagun Offshore Project's inaccessibility for domestic use is the most important factor. The domestic gas consumption to production ratio for the four offshore natural gas blocks is less than one tenth. Based on the data on offshore production and consumption of Myanmar natural gas, Myanmar would face a resource curse if it does not plan to consume enough gas resources for Myanmar industrialization and economic growth. According to the MOGE report on the annual production and domestic consumption from the four offshore natural gas blocks, it is important to emphasize the offshore gas data in order to make it more evident.

The Yadana Project began production in 1998 and generated 3211.47 (MMSCF) before beginning to use domestically in 2001. (Appendix. 5) Natural resource usage in Myanmar increased in direct proportion to natural gas production. When compared to other offshore blocks in the nation, the Yadana offshore block's output should be

considered to have been the most stable from 1998 to 2021. Under Thailand PTT and EGSA, exports began in 1998.

The Yadana Project would witness an increase in output of 277964.63 (MMSCF) in 2005, six years after it began producing, as a result of the addition of natural resources to the block. Yadanar's natural gas block was connected to Thon Myain Kalay in 2001 by a 20-inch pipeline, and Yadanar's gas project was connected to Yangon in 2006 via a 20-inch pipeline running from Kanbout. The Yadana project generated 5600104.8 million cubic feet of natural gas between 1998 and 2021, according to a table made public by MOGE. There are 957,349 million cubic feet of natural gas used domestically. There have been natural resource deposits in Yadanar for more than 23 years.

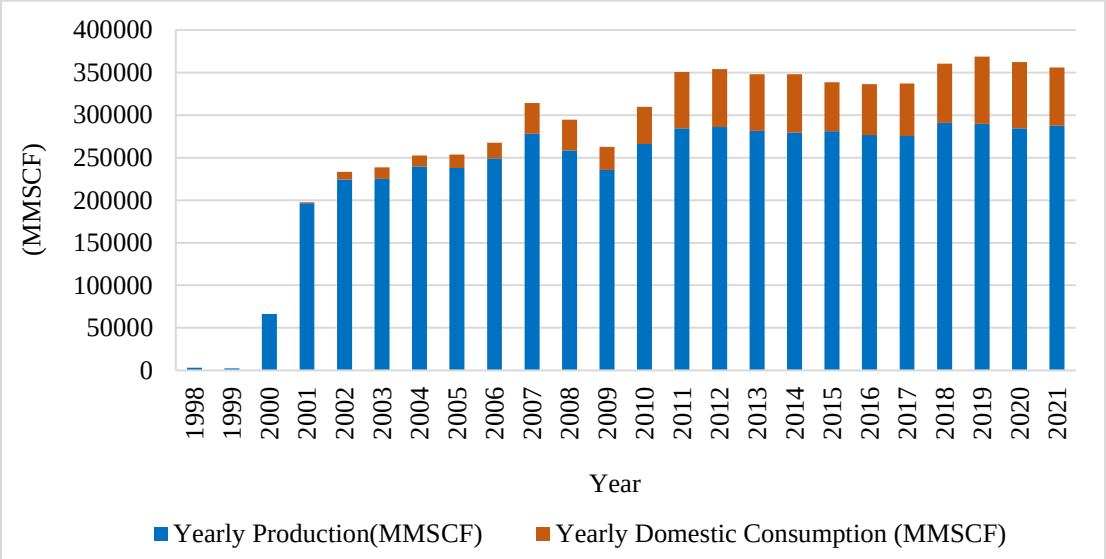
Yethagun stands apart due to the lack of a domestic sales strategy. Natural resource production reached 15619.05 million cubic feet in the second year, which is significantly less than the Yadana Gas Project's production volume. Natural gas production in Yethagun began in 1999 with a capacity of 542 million cubic feet, and it has steadily expanded to a capacity of 155485.4 542 million cubic feet in 2013. Production then gradually reduced until 2021. More than 22 years have passed since the construction of the flag block.

Off the coast of Rakhine, more than 40 nautical miles from the city of Kyawphyu, is where the Shwe gas project, which began in 2013, is situated. The production process is overseen by Korea's Daewoo Company, which purchases the natural gas generated in China.The production process is overseen by Korea's Daewoo Company, which purchases the natural gas generated in China. The route for distributing natural gas to China originates in central Myanmar. 20177.3 million cubic feet of natural resources were used in the first production, which began in 2013. Natural resources totaling 336.11 million cubic feet were collected for domestic consumption in the first year of production. The Shwe block has the unique quality of having more natural resources than any other block, increasing to 119330.69 million cubic feet in the second year. The production of natural gas has been steadily rising since 2014.

A total of 1422741.01 million cubic feet of natural gas were produced from the Shwe gas project, which began in 2013, and 220767.73 million cubic feet of natural gas were produced for domestic use. The Shwe gas project, which is the development of Myanmar's natural resources, also has a lot of promise. Zaw Tika is one of the most recent offshore blocks to begin producing natural gas. This project, which is located off

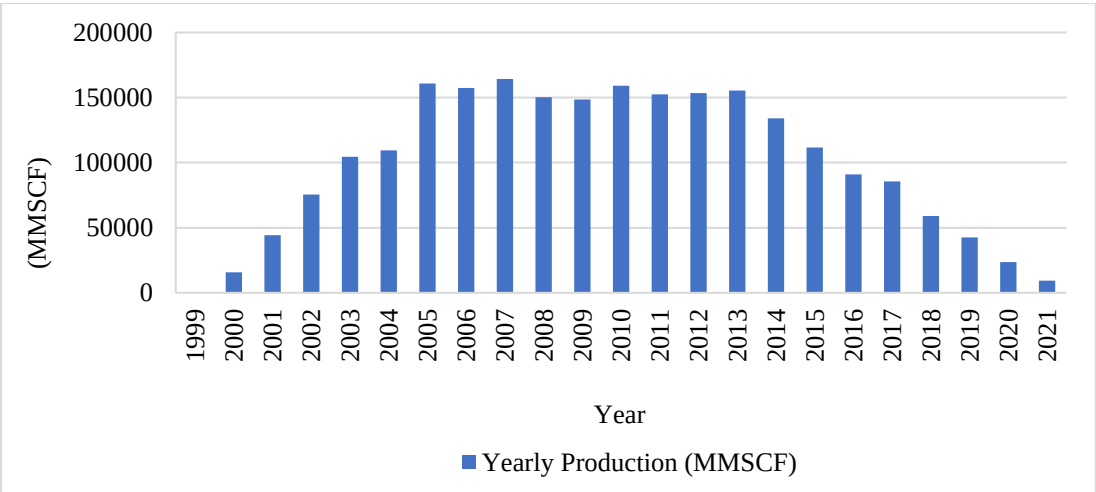
the coast of Muttama, is a joint venture with Thailand's PTTEP, MOGE, and PSC agreement. In 2014, with 56331.63 million cubic feet of natural resources, the first production began. The Zaw Tika Block, which was the first to be produced, has the highest proportion of natural resources available for consumption in Myanmar at 16,755.56 million cubic feet. Natural resource production as of this point totals 867422.33 million cubic feet, while domestic consumption stands at 194588.29 million cubic feet.

Figure (4.4) Production and Domestic Consumption of Natural Gas of the Yadana Offshore Project (1998-2021)



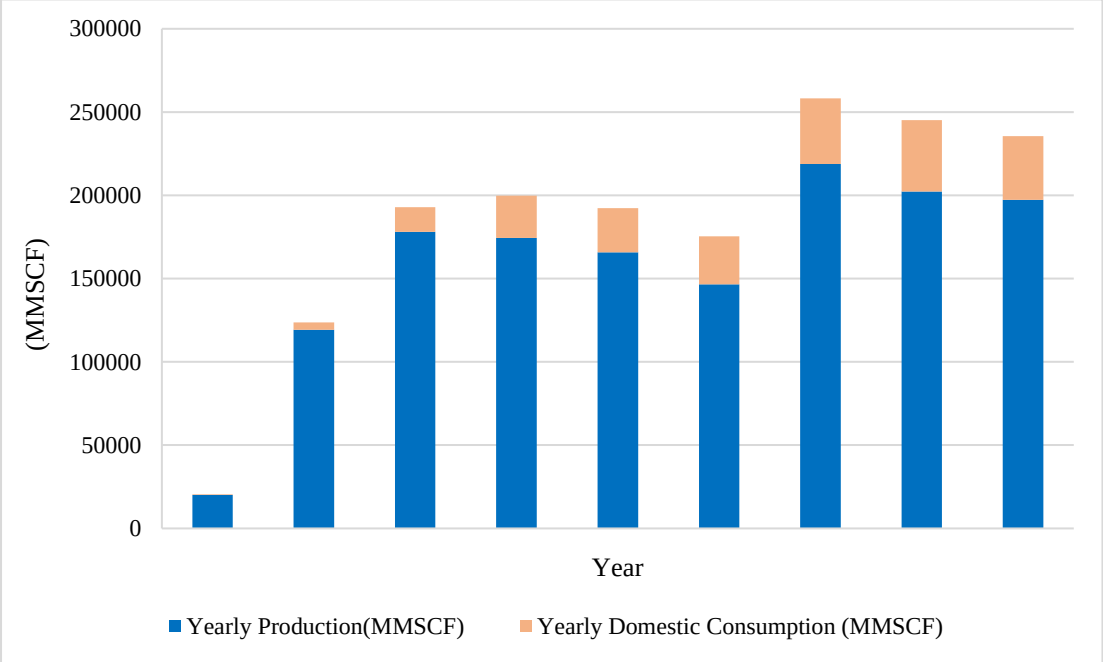
Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

Figure (4.5) Production and Domestic Consumption of Natural Gas of the Yethagun Offshore Project (1999-2021)



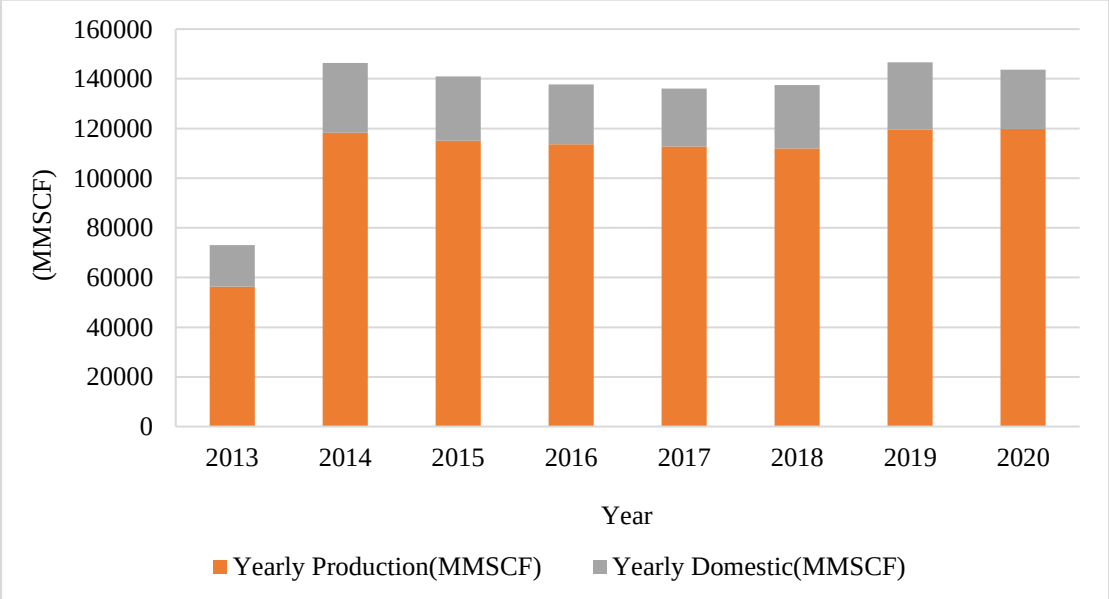
Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

Figure (4.6) Production and Domestic Consumption of Natural Gas of the Shwe Offshore Project (2013-2021)



Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

Figure (4.7) Production and Domestic Consumption of Natural Gas of the Zawthika Offshore project (2014-2021)



Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE

4.3 Export of Natural Gas in Myanmar

According to statistics, Myanmar shipped 80% of its natural gas to Thailand and China. Compared to other sectors of the economy, the revenue from natural gas exports is growing steadily year after year. Offshore natural gas exports started to generate revenue abroad in 1998. Natural gas was produced by onshore projects up to 1998, but industries were the only uses for the turbines located close to oil fields. From the 1980s until 1998, onshore natural gas production commenced; the natural gas generated in Myanmar could not be exported.

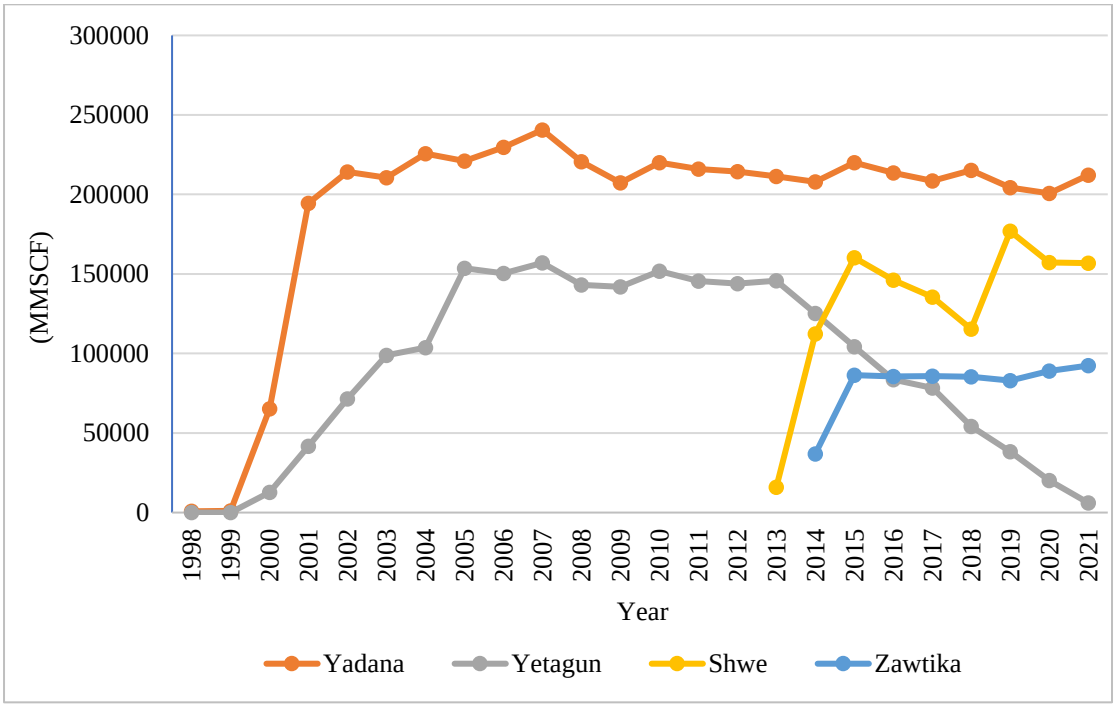
In 2015, Myanmar exported 491,232 MMcf of its natural gas production, or 76% of its total output (Woldmeter, 2018). In 2017, around two-thirds of Myanmar's natural gas output was exported to Thailand (10.4 bcm, or 1,016 mmcfd), and China (3.8 bcm, or 371 mmcfd) (cedcdata, 2021). Updated data from the MOGE shows that Myanmar exported 467463.73 MMSCF worth of natural gas in 2017. All of the natural gas exported to Thailand comes from the southern offshore gas resources, which include Yadana, Zawtika, and Yetagun offshore project, and is delivered under a 30-year contract that expires in 2028. The volume of natural gas exported to Thailand has been stable at 8–10 bcm since 2000 and is covered by a 30-year contract that expires in 2028. All of the gas is obtained from southern offshore gas fields, such as Yadana, Zawtika, and Yetagun offshore project. After the export pipeline from the northern offshore Shwe gas field to the Chinese border was finished, Myanmar started exporting natural gas to China in 2014. Around 3.8 bcm, or 80% of the Shwe gas field's output, was sold to China in 2017. Thus, gas from the Yadana, Yetagun, and Zawtika fields is exported to Thailand, while gas from Shwe is exported to China.

According to the Ministry of Planning and Finance, more than $1,715 million was earned from natural gas exports during the first half of the 2021–2022 fiscal year, which runs from October to March (the mini-budget period). The month of November had the largest monthly exports. Natural gas exports brought in a total of $1,715.2 million during the mini-budget (October to March) period of the 2021–2022 fiscal year, with payments of $280.2 million in October, $300.8 million in November, $274.2 million in December, $279.5 million in January, $290.2 million in February, and $290.3 million in March.

Natural gas exports contributed $229.2 million to the nation's revenue in April 2021 and $289.9 million in April 2022. Natural gas export revenue is higher than $60.7 million compared to the same period last year. According to the Ministry of Commerce,

Myanmar's natural gas exports to its neighbors, including China and Thailand, generated over US$800 million during the first four months of the fiscal year 2022–2023. From 1 April to 31 July, the Ministry of Commerce anticipates that 77.89 million kilo of natural gas were exported via gas pipelines, earning $819.503 million. In April, Myanmar received $135 million; in May, $194 million; in June, $286.033 million; and in July, $204.47 million.

Figure (4.8) Gas Export by each Project by Yearly (MMSCF)



Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE and available Sources

Figure (4.8) above shows that Yadana Offshore Block started exporting 789.98 million cubic meters of natural resources in 1998. (Appendix 6, 7). 12,814.95 million cubic feet of natural gas are exported to Thailand two years after the Yetagun block was established. Natural resources of 80049.90 million cubic feet were shipped to Thailand from the two projects in 2000. China received 16030.57 million cubic feet of natural gas from Shwe Offshore's third shipment in 2013. Three offshore natural resources were present in 2013, and a combined 373,168,68 million cubic feet of natural resources were exported. When the Zawtika offshore project began in 2014, 36962.47MMSCF of natural gas were exported to China.

Four offshore natural resources were available in 2014, with a total exportable volume of 482463.09 MMSCF. Myanmar has produced less natural gas since 2016 on average. Production from the Yetagun natural gas project specifically fell more dramatically, from 104238.96 MMSCF in 2015 to 83638.31 MMSCF. The three remaining blocks also fell down a little. At that time, the price of oil decreased on a global scale. The decreasing production of the Yadana offshore block and Yetagun offshore block has shown that the thirty-year offshore natural gas reserves approach the reduction in production.

Offshore Gas Projects

In the Andaman Sea, there is an offshore gas field called Yadana. The closest landfall in Myanmar is around 60 kilometers (37 miles) offshore from where it is located. The gas field is a significant source of income for the government of Myanmar. About 8% of the electricity in neighboring Thailand and about 50% of the electricity in Yangon, Myanmar's largest city, are produced by gas from Yadana. State-owned Myanma Oil and Gas Enterprise (MOGE) made the discovery of the Yadana gas field in 1982.

At the time, MOGE lacked the financial and technical resources necessary to grow Myanmar's oil sector because it was still off-limits to foreign investment. That changed in the late 1980s when Myanmar made the decision to hire foreign businesses to exploit its hydrocarbon resources. Total was chosen, and Total E&P Myanmar was established. The field's reserves were then revised in July 1992 and valued at 5,300 billion cubic feet during the preliminary stage (150 billion cubic meters). This sum was regarded in 1994 and 1995 as adequate to make growth economically viable.

Yadana Project is a producing conventional gas project run by Total E&P Myanmar that is situated in shallow sea in Myanmar. The field has a 164-foot water depth and is situated in blocks M 5 and M 6. Myanma Oil and Gas Enterprise, Chevron, PTT Public, and TotalEnergies are the field's owners. Total Energies (31.24%), Myanma Oil and Gas Enterprise (15.00%), Chevron (28.16%), and PTT Public (25.50%) are the majority of the owners of the Yadana Project Field. After three and a half years of work and a sizable amount of money invested, production started in 1998. At the moment, a new pipeline to Yangon guarantees that 25% of production, or roughly 2 billion cubic meters annually, is supplied to Myanmar's local market, with the remaining being transported to Thailand. The Yadana complex's Blocks M5 and M6

underwent extra extensive construction in 2014 with the goal of expanding the Badamyar field and putting in a new compression platform.

Beyond Blocks M5 and M6, Myanmar is also actively engaged in exploratory efforts. After successfully bitting a bid in response to the Myanmar government's 2013 request for tenders, it signed an exploration contract for deep offshore Block YWB (100%) in February 2015. It purchased a 40% interest in offshore Block A 6 in the summer of 2015. The Yadana gas field has an estimated field life of more than 30 years and contains more than 150 billion cubic meters of natural gas. The output was 780 million cubic feet per day on average in 2009. (Tan Hwee Hwee,2009).

In addition to PTT, a Thai state-owned oil and gas company, and Myanma Oil and Gas Corporation (MOGE), a state-owned enterprise of Myanmar, the Yadana gas field and pipelines are operated by TotalEnergies, a French energy organization, with Chevron Corporation, a US-based company, as its junior partner. Total Energies is in charge of running the gas field. In terms of working interest, Total Energies holds 31.2%, Chevron 28.3%, PTT 25.5%, and MOGE 15%. Total Energies stated in January 2022 that they were leaving their role as the Yadana project's operator and joint venture partner and that PTT Exploration and Production Public Company Limited (PTTEP) had taken over.

The remaining project partners have selected PTTEP to serve as the new operator. On July 20, 2022, the transition of operatorship is anticipated to be finished. According to the Production Operating Agreement (POA), the remaining joint venture partners will receive Total Energies' share, which has no commercial value, in proportion. PTTEPI will own 37.0842% of the participating interest in the project after the effective date of Total Energies' withdrawal, while Unocal Myanmar Offshore Company Limited, a Chevron affiliate, will hold 41.1016%, making it the largest participating interest in the project (Total Energies withdraws from Myanma 2022).

According to earlier information provided by Total Energies, the French company has operated the Yadana gas field (Blocks M5 and M6) in Myanmar since 1992 along with its partners Unocal-Chevron (28.26%), Thailand's PTTEP (25%) and the Burmese state-owned enterprise MOGE (15%). (March 14, 2022). The remaining project partners have nominated PTTEP as the new operator, according to PTTEP. To ensure a smooth transition and production continuity in accordance with the safety standard, the operatorship transfer, which is anticipated to be finished on July 20, 2022, needs Total Energies' full cooperation.

Approximately 770 million standard cubic feet per day (MMSCFD), or 220 MMSCFD, of natural gas are currently produced by the Yadana plant, according to PTTEP. This supplies 50% of Myanmar's total demand for gas, which is used to generate electricity. As 550 MMSCFD of gas from the field is channeled to 12 different power plants to generate electricity, Thailand also depends on this source of energy to meet the needs of its 11 million residents who live in the country's central and western regions. Approximately 11% of Thailand's gas demand was met by this imported gas in terms of volume. With peak production in 2012, the Yadana Project conventional gas field recovered 66.42% of its total recoverable reserves.

An offshore gas field in the Andaman Sea's Gulf of Moattama is called the Yetagon gas field. The Yadana project was followed by the US$700 million Yetagun ("Flag of victory") project, which was Myanmar's second natural gas offshore project (Kin Wah Chin) (2005). Petronas, a Malaysian oil and gas company, has left the offshore Myanmar Yetagun field's Blocks M12, M13, and M14. Since 2003, Petronas has managed the Yetagun Gas Project, where it has a 40.9% participating interest. Additionally, PTTEP International Limited, Nippon Oil Exploration (Myanmar) Limited, and Myanmar Oil and Gas Enterprise (20.5%) were partners (19.3 percent).

The Yetagun gas field is situated about 230 kilometers off the coast of Myanmar in the Taninthayi region of the southern Andaman Sea. The field is submerged in water 105 meters deep. The Yetagun field, which spans three offshore blocks M12, M13, and M14, is distributed across an area of about 24,130 km2. The Yetagun gas field is located in offshore Myanmar in blocks M12, M13, and M14, which Petronas Carigali Myanmar and PC Myanmar (PCML) have decided to leave.

A reserve of 3.2 trillion cubic feet was thought to exist in the Yetagun gas field (91 billion cubic meters). Production began in 2000 at 200 million cubic feet per day (5.7 million cubic meters per day), with a maximum capacity of 300 million cubic feet per day (8.5 million cubic meters per day). A 24-inch (610 mm) diameter pipeline with a 169-mile (272-km) length carries it to Thailand. [1] The majority of the pipeline, which connects with the Yadana pipeline on land, is onshore and is located underwater for around 140 miles (230 km) of its whole length. Furthermore, Yetagun had a daily capacity of 8,000 to 9,000 barrels of gas condensate (Kin Wah Chin) (2005).

Together with Premier Oil (30%), Nippon Oil (20%), and Texaco (50%), the Yetagun gas field was developed. Texaco left in 1997, followed by Premier Oil in 2002, and Petronas took over as the operator (Sudhir Devare, 2008). There was a leak in the

Yetagun gas pipeline in 2008, which cost Thailand 400-500 million cubic feet per day (cfd) (Reuters, 2008). PTTEp has announced that as part of its portfolio management, it has decided to exit both the Yetagun project and the gas transportation company in Myanmar. PTTEP continues to place the highest priority on the continuation of natural gas production because it is a key resource for producing electricity, which is essential for sustaining human life and raising standards of living. It is also a crucial component of both economic growth and energy security. In 2021, the project sold a total of 560 barrels per day of condensates and 17 MMSCFD (million standard cubic feet per day) of natural gas on average.

Operator of the field with a 40.91% share is Petronas Carigali Myanmar (Hong Kong), a subsidiary of Malaysian oil and gas company Petronas. The other partners in the project are Nippon Oil Exploration (Myanmar) (NOEM), PTTEP International (PTTEPI), Myanmar Oil and Gas Enterprise (MOGE), which holds a 20.45% interest, and Myanmar Oil and Gas Enterprise (NOGE), which holds a 19.32% interest. In 2013, Mitsubishi of Japan acquired a 10% share in NOEM, gaining access to the Yetagun gas and condensate field.

The decision was made after a techno-commercial evaluation that was in line with the shifting global priorities of the parent company, Petronas, the company's decision-maker. Yetagun's operator Petronas has tried to stop or reverse a continuous fall in output that has been recorded since about 2013. After the production rate dropped below the offshore gas processing plant's technical threshold in April 2021, Petronas declared force majeure and halted operation, according to Petronas.

The Yetagun gas field was found in December 1992, and commercial production began there in May 2000. In October 2014, the gas field at Yetagun North began to produce. There are reportedly 80 million barrels of condensate and three trillion cubic feet of gas in the gas field. In order to transport the gas to the receiving station, the Yetagun gas field project consists of onshore and offshore production facilities, as well as a subsea and onshore pipeline. Additionally, a 245 m long Yetagun FSO vessel on lease from SBM Offshore was included.

Two platforms were initially set out for the project, each made of 30,000 tonnes of steel, in 103 meters of water. The platforms included the Yetagun B processing platform and the Yetagun A wellhead platform, which are used to separate and dehydrate the generated gas and condensate, respectively. The project involves building a 202 km long, 24 inch wide offshore pipeline in the Andaman Sea to link the Yetagun

gas field with the onshore receiving center. Along with that, it has a 67 km long onshore pipeline that transports natural gas from the reception center point to the PTT receiving station.

With a $650 million investment, UK-based Premier Oil first launched the Yetagun platform and pipeline construction project. The business left the gas project in September 2003, and Petronas took over as operator. The Yetagun FSO had to be decommissioned in order to make way for a new vessel as part of the FSO replacement programme. By installing the Yet Sena FSO (Bratasena) for the Yetagun field, the decommissioning was completed in 2018.

The engineering, procurement, building, and commissioning contract for the Yetagun expansion project was given to Thai Nippon Steel Engineering & Construction Corporation. Production on the Yetagun field temporarily stopped after Petronas Carigali Myanmar (Hong Kong) issued a force majeure (FM). The declaration was made after the output rate dropped below the required level. In 2021, the Yetagun field produced an average of 17 million standard cubic feet per day (MMSCFD) of natural gas and about 560 barrels of condensate per day. PTTEP and Petronas announced in May 2022 that they would be abandoning the Yetagun gas project. PTTEP has also declared its intention to leave Taninthayi Pipeline Company, which transports the gas produced in the field to Thailand.

The Shwe Natural Gas Project is a multi-field integrated development made up of the offshore gas fields Shwe, Shwe Phyu, and Mya, all of which are in Myanmar's blocks A-1 and A-3 in the Bay of Bengal. A group of six companies, led by the POSCO subsidiary Daewoo International, is developing the project in three phases. The partnership is made up of POSCO Daewoo International (51 percent, operator), ONGC Videsh (17 percent), Myanmar Oil and Gas Enterprise (15 percent), Gas Authority of India (8.5%), and Korean Gas Corporation (8.5 percent). Korean Gas Corporation (KOGAS) (8.5%), ONGC Videsh Limited (17%), Myanmar Oil and Gas Enterprise (15%), POSCO DAEWOO Corporation (51%), GAIL (India) Limited (8.5%), and ONGC Videsh Limited (17%). [3]. In July 2013, the Shwe natural gas project's first phase's initial gas production was accomplished. Phases two and three are currently being created.

First gas from Zawtika Development Project's phase two; PTTEP International operates the producing conventional gas production in shallow water in Myanmar. The field has a 4,121-foot water depth and is situated in blocks M 9 and M 11 (Zawtika).

The Zawtika Development Project has a related expansion project called Zawtika Development Project Phase 1D. The approval phase of this project is now underway, and work is scheduled to begin in 2025. The Zawtika project entails the development of the Zawtika, Kakonna, and Gawthaka fields, which are situated in blocks M9 and M11 of the Gulf of Martaban offshore of Myanmar.

11,746 square kilometers total are covered by the project. The project's operator is PTTEP International, which stands for Petroleum Authority of Thailand Exploration and Production. Myanma Oil and Gas Enterprise (MOGE) has the remaining 20% of the project's equity, with PTTEP owning 80% of it.

In the final quarter of 2011, PTTEP provided MOGE with the field development plan for the project. In February 2011, the proposal was approved. In the third quarter of 2013, the project's detailed engineering and construction work was finished. A total of 60 million standard cubic feet per day (MMscf/d) of natural gas were first delivered by the $2 billion project to Myanmar for domestic use beginning in March 2014. It began sending 240MMscf/d of natural gas to Thailand in August 2014. An estimated 18 trillion cubic feet (tcf) of natural gas and 3.2 billion barrels of oil are both found in Myanmar. Thailand receives around 25 percent of this production.

Thailand's imports have increased to 1.2 to 1.3 billion cubic feet per day as a result of the Zawtika field's output. Peak production for the conventional gas field of the Zawtika Development Project is anticipated to occur in 2025, recovering 22.20% of its total recoverable reserves. Natural gas output will reach its peak at about 400 Mmcfd. Production will continue until the field reaches its economic limit in 2063, according to economic projections. Approximately 19% of the daily output of the nation is currently produced in this field.

4.3 Prospects in Myanmar’s Oil and Gas Blocks

In 2010–2011, the industrial and transportation sectors predominantly used the electricity generation sector. The average annual increase is 9.3 percent per year, according to Myanmar's 2019 energy data. The largest natural gas consumer, the electrical industry, consumed 121,748 million cubic feet of gas in 2018–2019, or 87 percent of all natural gas used. The second-largest consumer of natural gas, the general industrial sector utilized 10,549 million cubic feet of it, or 7% of the total. From 2021 to 2030, the natural gas demand for the electricity generation industry may rise from 531 million cubic feet (Myanmar Energy Statistics, 2019). Natural gas demand is

anticipated to rise to 6.2%, or 7 million cubic feet per day. However, due to decreased natural gas consumption activities, industrial zones in large cities lack a strong natural gas supply network. The opening of CNG outlets in the Yangon Region is also planned for the period 2021–2023 in the transportation sector.

The Yangon-Mandalay Expressway and Mandalay Region will see the opening of eleven (11) stores between the years of 2026 and 2030, according to the MOGE website. These stores will require 17.186 million cubic feet of space every day. Additionally, 2.95 million cubic feet per day will be needed for the five stores that will be opened on Mawlamying Road, while 2.93 million cubic feet per day will be used in the five stores that will be opened on Yangon-Pathein/Rangoon-Bo Kalay Road. By 2030, the transportation industry will need 151 million cubic feet per day of natural gas, up from the 110 million cubic feet per day needed in 2021. 240 million cubic feet of this sector will be required by 2040. (ERIA, 2018).

Regarding the offshore gas production project, the offshore territory of Myanmar, particularly Block A-6 in the Rakhine region, has enormous potential for producing Myanmar's oil and natural gas reserves. Around 2012, the oil company MPRL E & P Company, owned by nationals of Myanmar, carried out test drilling. In 2013, MPRL E &P discovered a potential natural gas reservoir at a depth of roughly 2,000 meters. In order to collaborate with foreign businesses that have expertise in deep-sea oil exploration, they offered shares. MPRL E&P is currently carrying out exploratory efforts with JV Partners (20%, Operator), Woodside (40%), and total (40%).

Private Companies and CNOOC renewed their agreement in 2014 and kept working together. Despite the fact that KMDC Korea is a joint venture, Blocks A-5 and A-7 have been transferred. A-1, A-3, and A-6 have discovered natural mineral resources with good potential. The government of Myanmar should therefore support and encourage any such endeavor. The potential for commercial natural gas has also been discovered in the nearby blocks A-4, A-5, and A-7. Furthermore, the oil and natural resources will be severely relied upon by the islands off the coast of Rakhine, thus the government should prioritize energy policy.

To promote economic growth, the national government supports the establishment of successful industrial zones. It has been discovered that these industries' ability to produce goods successfully depends on the power sector, and that sector's ability to produce electricity is becoming more and more dependent on natural gas.

Natural gas-fired power plants are quickly evolving into a power source that can primarily meet the electricity demands of every business sector. As a result, it is essential for the stability of the electrical sector, which is essential for the growth of the domestic economy, to build natural gas infrastructure and make adequate natural gas available. According to the most recent calculations of Myanmar Energy data, the country's natural gas demand would rise from 929 million cubic feet in 2021 to 1,323 million cubic feet in 2030 and it may rise to 1,433 million cubic feet by the year 2040, respectively. Furthermore, between 2011 and 2019, Myanmar's onshore and offshore natural gas production decreased by an average of 2.3 percent per year (SOD, 2020). Since 2021, the most natural gas has been produced from offshore blocks, but this production has been decreasing. By 2040, offshore natural gas output might drop from 1,900 million cubic feet per day in 2015 to only 100 million cubic feet (Myanmar Energy outlook 2020).

CHAPTER V
CONCLUSION

5.1 Finding

Natural gas is a fossil fuel that occurs beneath the Earth's surface and is a naturally occurring hydrocarbon gas. Heating, cooking, and the production of electricity are all done with natural gas. The manufacturing industry and the transportation sector both use natural gas as a fuel. A major producer of natural gas and petroleum in Asia, Myanmar is a growing nation. With its initial crude oil exports occurring in 1853, it is one of the oldest petroleum industries in the world. The oil and natural resource sector in Myanmar has seen numerous structural changes, as well as changes in leadership and major ministries. In Southeast Asia, it has been more than 120 years since 1900.

The nation's efforts to establish an upstream hydrocarbon sector have been hampered by years of exclusion, sanctions, a lack of technical expertise, and insufficient funding (EIA, 2015). The petroleum sector garnered the largest amount of foreign direct investment (FDI) in Myanmar's history (USD 4.8 billion) in 2015–2016. (SOD 2019). By the end of December 2021, international investment in the oil and gas industry of Myanmar had amounted to $17038.395 million, or 23.03 percent of all foreign investment in the nation.

Myanmar has been re-engaging with the international community since 2011 as a result of political reforms, the adoption of a market economic system, and two international tender calls for the energy industry in 2011 and 2014. Despite the fact that Myanmar's energy industry has more than 100 years of experience, it is clear from the explanation in Chapter 3 that the country's oil and natural gas have not yet played the part they should have since that time. In accordance with the State of Department report from 2019, MOGE, which is in charge of the oil and gas sector in Myanmar, had to make several modifications due to outdated technology and equipment used in the oil and gas industry, as well as outdated tools for excavating and measuring seismic activity.

Due to the openness of Myanmar's natural resource earnings, there are laws and regulations that follow worldwide best practices. Additionally, numerous committees about the institution have been formed. New joint venture procedures can be developed for the oil and gas sector in Myanmar. With the assistance of international institutions, numerous reports on energy information have surfaced since Myanmar's Energy Policy was released in 2014. These reports indicate that these procedures will be crucial for Myanmar's oil and natural resource industry as well as for the principles of foreign investment.

Regarding the production, domestic use, and exportation of oil and gas, as well as the status of gas projects and gas processing, all of which are detailed on an annual basis. For the purpose of oil and gas exploration, the nation has designated 26 deep water blocks and 51 onshore blocks, totaling 53 offshore blocks. In terms of power from onshore use, transportation and cooking account for 23.97%, 1.59% for industry, and 12.14% for other uses. Power consumption from offshore sources is (97.00%), with 0.20 % going to industry, 0.02 % to raw materials, 1.73 % to transportation, 0.73 % to cooking, and 0.73 % to other uses.

Almost all of the government's hydrocarbon revenues come from Yadana and three other massive gas projects. Natural gas is Myanmar's second-largest export after manufactured products. Total, which manages the Yadana gas field, spent around US$254 million to Myanmar in the year leading up to March 2018 according to the most recent data available for all businesses. While the Shwe project was run by South Korea's POSCO, the Yetagun project was run by Petronas, which gave the government the equivalent of US$208 million that year. PTTEP of Thailand, which manages the less significant Zawtika gas project, paid US$41 million.

Nearly all of Myanmar's US$737 million in oil and gas revenues in the year to March 2018 came from these massive operations, which supply natural gas to Thailand and China. The transport fees that businesses paid to use gas export pipelines that were built on land taken from indigenous people that year brought in additional $300 million for the government. According to a Myanmar budget document created prior to the coup, Myanmar was expected to receive 2,305 billion kyat from oil and gas in the year leading up to March 2022. This would represent just over 10% of all government revenue this year, which is a little decrease from prior years. Due to the high volatility and frequent changes in oil and gas prices, it is uncertain whether Myanmar will truly make its projected 2,305 billion kyat. Four large offshore projects generating natural

gas, which is still significant, provided the majority of the extractive industry's earnings in Myanmar. Natural gas production from the Yadana, Shwe, and Zawtika projects was exported in proportions of 73.9 percent, 79.6 percent, and 77.2 percent in 2020–2021, respectively.

Despite the fact that there are still sizable oil and natural gas reserves, as was discussed in the previous chapter, domestic consumption is quite low. In order to achieve economic growth, the responsible ministry should prioritize developing domestic industries over export-oriented industrial policy and the upstream energy sector. This is done in order to balance domestic consumption with the ministry's primary objective of earning foreign currency. Furthermore, it is acknowledged that this industry has been improving. According to Myanmar's energy policy, however, exports to foreign countries must be reduced while local use must rise. Even if the four offshore blocks collectively generate billions of dollars in foreign currency, local oil companies stand to gain if the majority of the gas and oil fields can be operated domestically. The four foreign offshore blocks' experiences are extremely important to Myanmar's oil and natural resource sector.

The greatest source of foreign exchange Myanmar has access to is from gas income. The Myanmar government office that receives money from the valuable offshore gas projects in the nation, the Myanma Oil and Gas Enterprise (MOGE), was taken over by the military early on in its February 2021 coup. The management of Myanmar's oil and gas industry, the main source of the nation's foreign revenue, must also be transparent, sound, and systematic.

5.2 Suggestions

In order to attain energy self - sufficiency and boost exports that potentially generate significant foreign revenue, Myanmar is seeking to efficiently explore and exploit its own local natural gas deposits. The energy industry, transportation, industry, and family cookery are all included in the utilization of gas. The consumption of domestic natural gas has increased since 2011, when Myanmar started its democratic transition. In the production of electricity, as a fuel for vehicles, and in industrial uses, natural gas use has significantly increased, although it is still mostly limited to these sectors.

Myanmar's daily demand for natural gas climbed from 518 million cubic feet in 2020 to 929 million in 2021. By 2030, it might rise by 1,142 million cubic feet, and by

2040, it might rise by 1,323 million cubic feet. In order to meet demand, natural gas output must be continuously increased. Gas production capacity is mostly produced offshore while onshore oil and natural gas blocks see ongoing output declines. Additionally, the government needs to figure out how to boost domestic manufacturing. The government should offer local private enterprises the essential assistance to operate, as foreign corporations are involved in practically all offshore initiatives. In order to avoid becoming further reliant on foreign nations for energy demands, efforts must be made to boost the involvement of local businesses in the growth of the domestic energy sector.Additionally, new foreign businesses must to be encouraged to invest in Myanmar.

In order to develop professionals and specialists for long-term investment, the government must establish energy literacy or education programs at institutions including universities, colleges, and technical training centers. Myanmar must therefore entice foreign investors to participate in offshore blocks that still have promise. Modern technology, infrastructure—such as cutting-edge drilling and excavation tools—pipeline construction operations, storage facilities or stations for distribution, financial support for local investors, labor capacity building, market research for new export channels, enticing investment policies for foreign investors, and flexible laws and regulations for ease of doing business are all necessary for the development of the oil and gas sector. The future economic development of all-around sectors in Myanmar will be supported by the exploration of efficient oil and gas production fields, encouragement of increased foreign investment, expansion of the foreign export markets, enhancement of effective utilization, and implementation of the comprehensive future strategy related energy sector.

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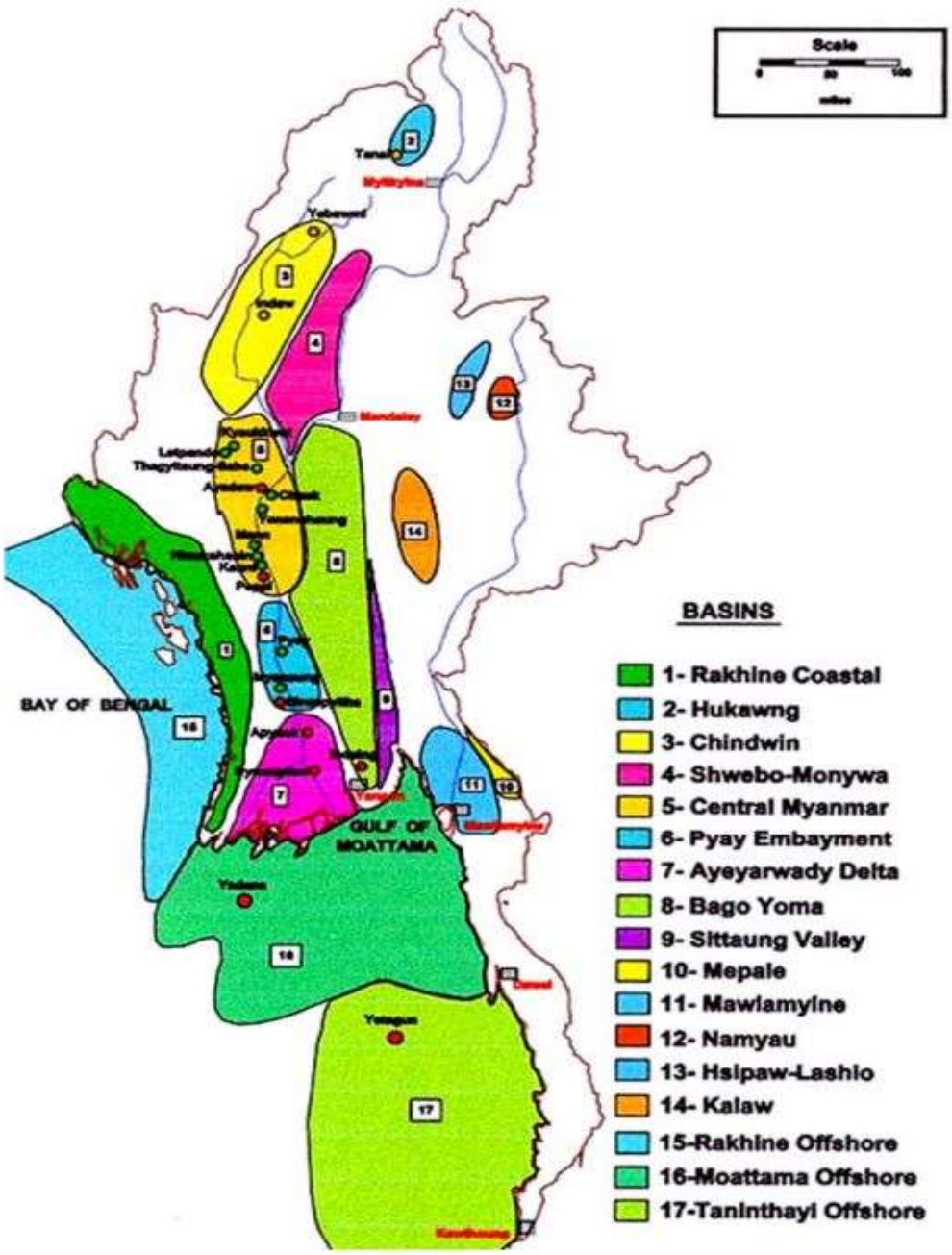
Appendix (1)

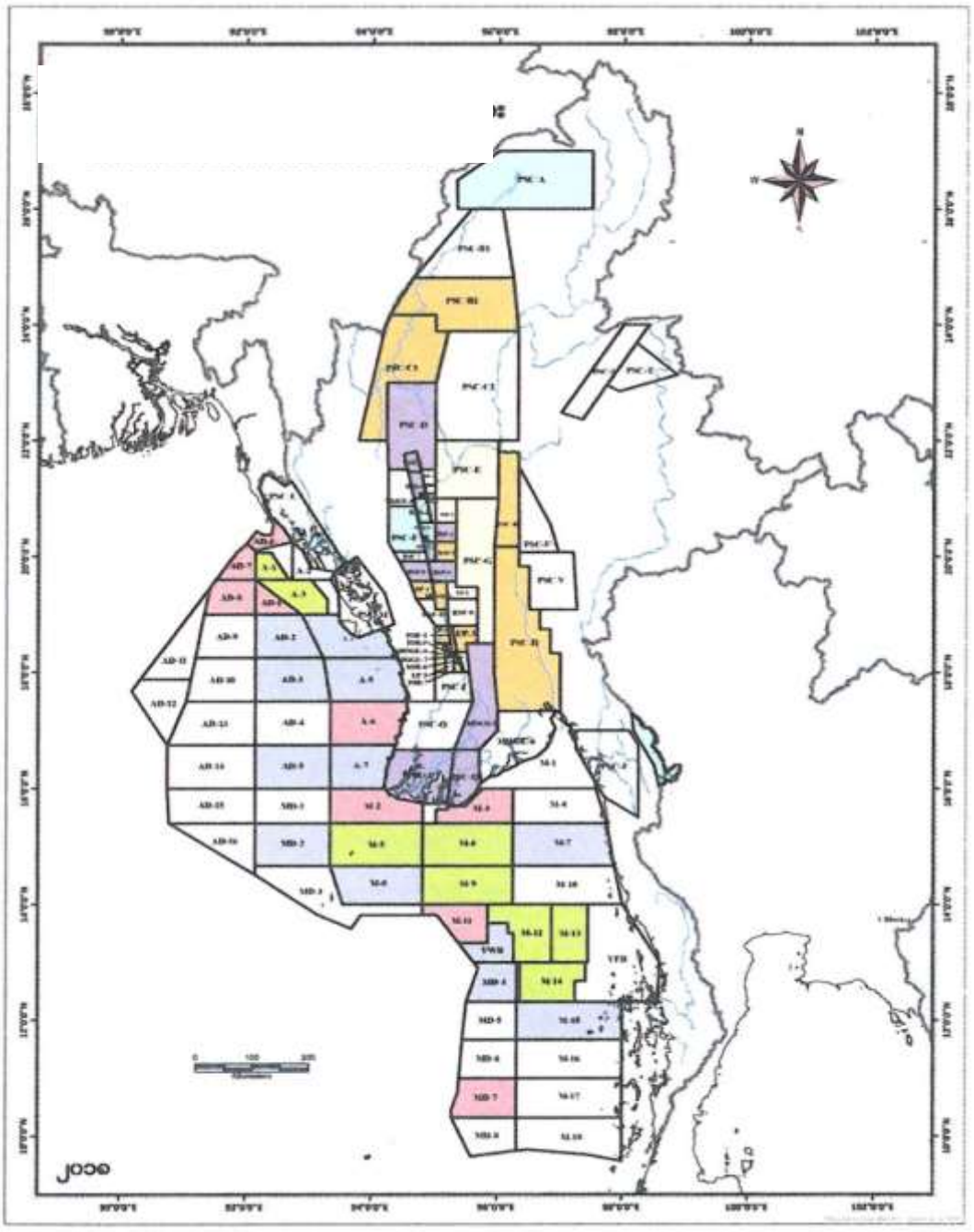
The Map of Myanmar Basin



Source: MOGE Website

Appendix (2)

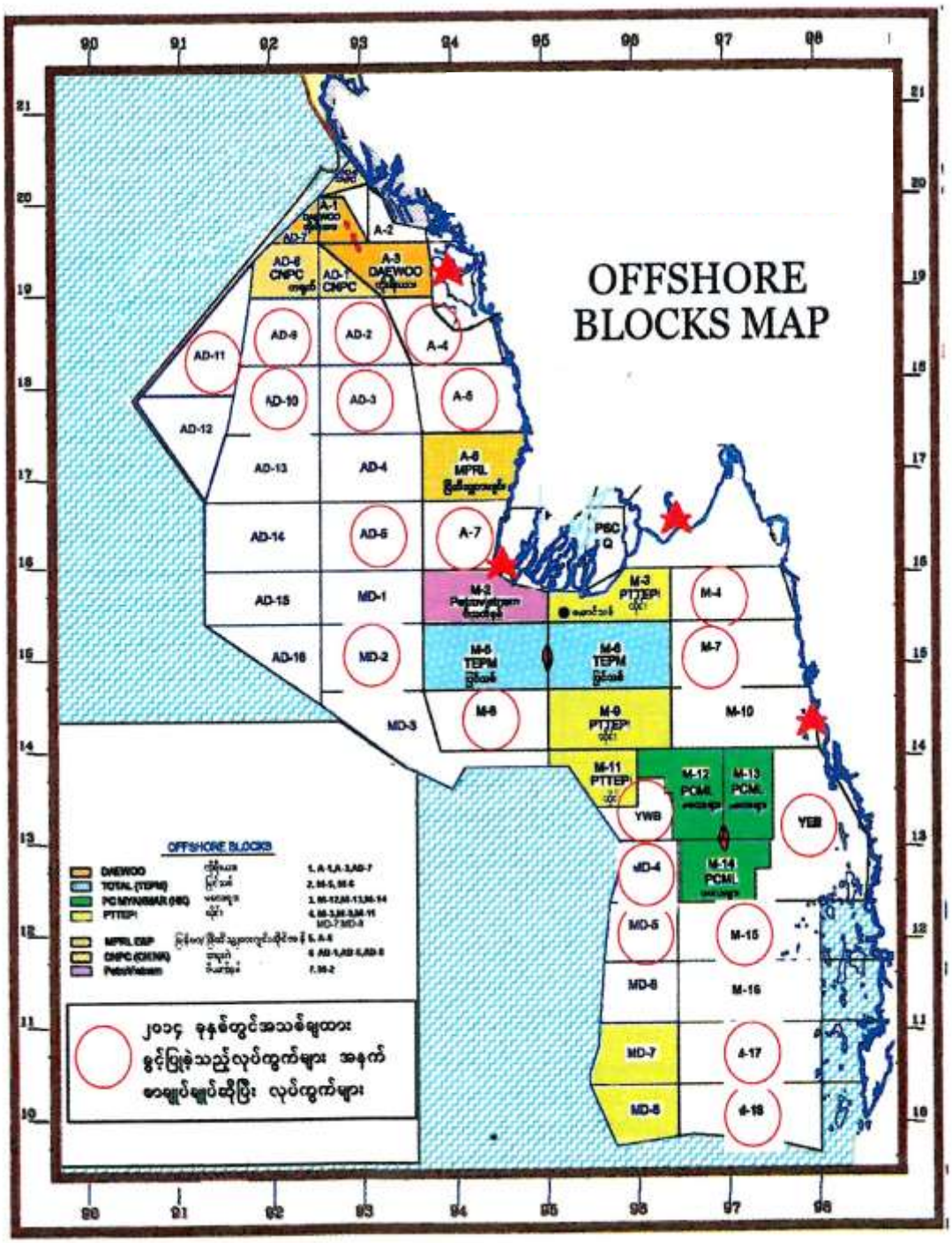
Onshore and Offshore Oil and Gas Fields



Source: MOGE Web site

Appendix (3)

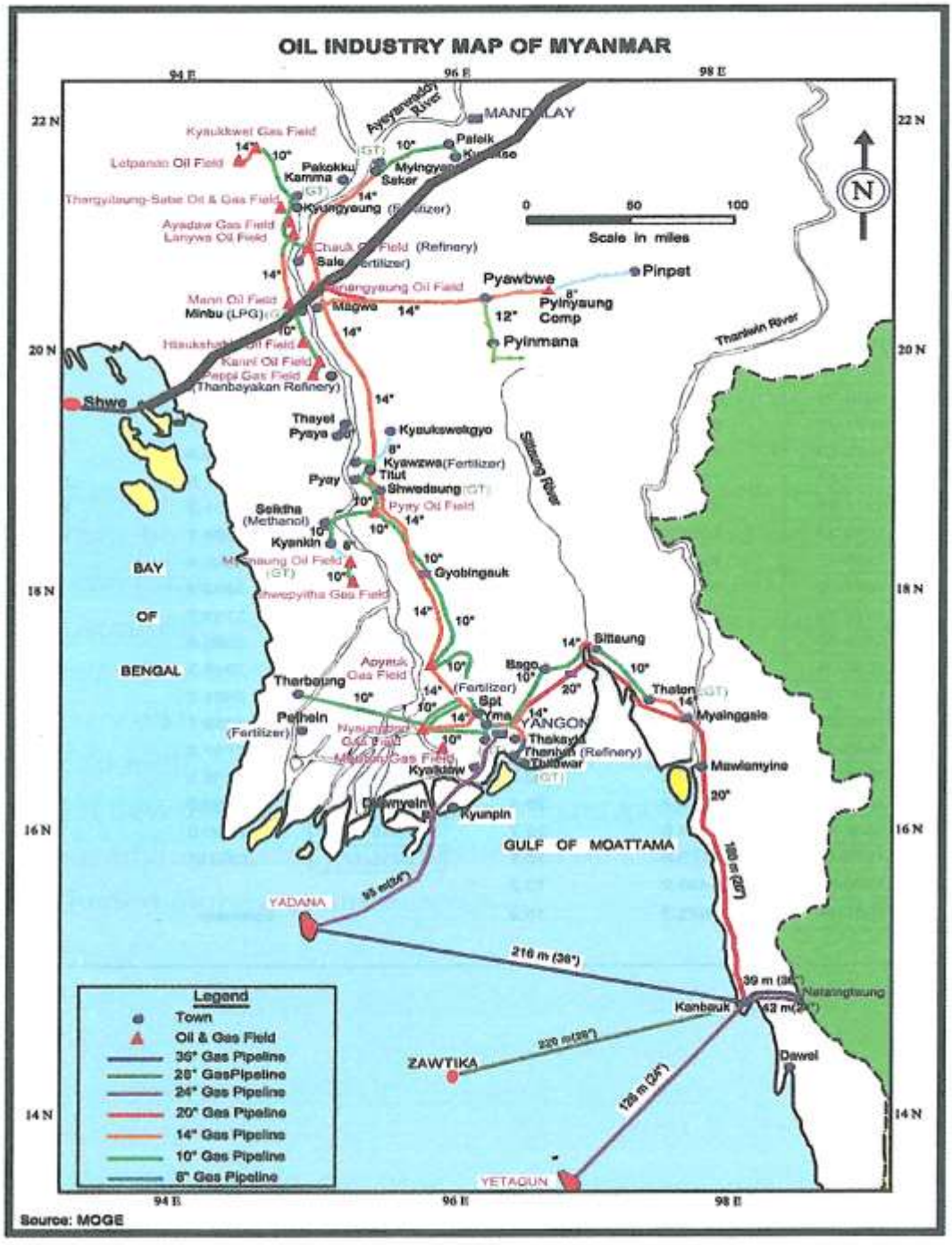
The Offshore Map of Myanmar



Source: MOGE website

Appendix (4)

Map of Oil and Gas of Myanmar



Source: MOGE web site

Appendix (5)

Annual Production and Domestic Consumption by Offshore Blocks (MMSCF)

Yandana				Yetagun		Shwe			Zatika		
Year	**Yearly Production (MMSCF)**	**Yearly Domestic consumption (MMSCF)**	**% of Domestic Consumption of Production**	**Yearly Production(MMSCF)**	**Yearly Domestic consumption (MMSCF)**	**Yearly Production(MMSCF)**	**Yearly Domestic consumption (MMSCF)**	**% of Domestic Consumption of Production**	**Yearly Production (MMSCF)**	**Yearly Domestic consumption (MMSCF)**	**% of Domestic Consumption of Production**
1998	3211.47	0		0							
1999	2247.16	0		542							
2000	66148.4	0		15619.1	0						
2001	196593	847.43	**0.43**	44248.5	0						
2002	224411	9002.39	**4.01**	75609.2	0						
2003	224994	13531.5	**6.01**	104518	0						
2004	239725	12907.2	**5.4**	109534	0						
2005	237943	15888.5	**6.7**	160749	0						
2006	249310	18293.3	**7.3**	157295	0						
2007	277965	36262.1	**13.1**	164274	0						
2008	258412	36440.1	**14.1**	150199	0						
2009	235531	27018	**11.5**	148635	0						
2010	265963	43766.1	**16.5**	158983	0						
2011	284520	66145.2	**23.3**	152513	0						
2012	285927	68179.1	**23.8**	153437	0						
2013	281373	66557.3	**23.7**	155485	0	20177.3	336.11	**1.7**			
2014	279709	68413.5	**24.5**	133996	0	119331	4371.72	**3.7**	56331.6	16755.6	**29.7**
2015	281109	57683.7	**20.5**	111677	0	178034	14852.9	**8.4**	118285	28041.9	**23.7**
2016	276748	59753.5	**21.6**	90904.7	0	174528	25245.1	**14.5**	115033	25967.2	**22.8**
2017	275424	61898.1	**22.5**	85615.8	0	165707	26610.5	**16.1**	113700	24025.1	**21.1**
2018	291052	69371	**23.8**	59099.9	0	146528	28953.1	**19.8**	112786	23272.9	**20.6**
2019	289799	79040.9	**27.3**	42428.6	0	218770	39379.7	**18**	111899	25618.7	**22.9**
2020	284642	77632	**27.3**	23577.7	0	202383	42696	**21.1**	119552	27067.9	**22.6**
2021	287347	68718.3	**23.92**	9226.62	0	197282	38322.6	19.5	119835	23839.1	**19.9**

Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE.

Appendix (6)

Gas Production and Exporting by each Project by Yearly (MMSCF)

Year	Yandana Porject			Yetagun	Shwe Porject			Zawtika Project		
	Production	Exporting	Export Percentage of Production		Production	Exporting	Export Percentage of Production	Production	Exporting	Export Percentage of Production
1998	3211.47	789.98	24.6	0						
1999	2247.16	1076.41	48	542						
2000	66148.42	65234.98	98.7	15619.05						
2001	196593.13	194502.08	98.9	44248.52						
2002	224410.77	214198.03	95.5	75609.17						
2003	224994.29	210530.22	93.6	104518.45						
2004	239725.16	225667.87	94.2	109533.58						
2005	237943.08	221039.47	92.9	160749.42						
2006	249310.2	229718.83	88.7	157294.68						
2007	277964.63	240581.86	86.6	164273.67						
2008	258412.37	220594.26	85.4	150199.22						
2009	235531.21	207336.27	88.03	148634.6						
2010	265962.78	220087.19	82.8	158983.33						
2011	284520.49	215931.6	75.9	152512.61						
2012	285926.69	214452.11	75	153437.22						
2013	281373.09	211453.85	75.2	155485.38	20177.3	16030.57	79.5			
2014	279708.5	208010.04	74.4	133995.9	119330.69	112264	94.1	56331.63	36962.47	65.6
2015	281109.06	220112.33	78.3	111676.93	178034.37	160215.77	89.9	118284.78	86396.9	73.1
2016	276748.46	213532.93	77.2	90904.67	174528.17	146233.98	83.8	115033.24	85638.76	74.5
2017	275423.79	208566.28	75.8	85615.78	165706.65	135521.55	81.8	113700.29	85885.46	75.7
2018	291052.43	215129.01	74	59099.93	146528.35	115355.42	78.8	112786.32	85397.79	75.8
2019	289798.92	204234.82	70.1	42428.58	218770.44	176854.16	80.9	111899.02	82959.45	74.2
2020	284641.95	200655.38	70.1	23577.65	202382.87	157233.96	77.7	119551.56	88921.02	74.4
2021	287346.75	212268.19	73.9	9226.63	197282.17	156741.06	79.6	119835.46	92420.79	77.2

Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE.

Appendix (7)

Gas Export by each Project by Yearly (MMSCF)

YEAR	Yadana	Yetagun	Shwe	Zawtika
1998	789.98	0	0	0
1999	1076.41	0	0	0
2000	65234.98	12814.95	0	0
2001	194502.08	41726.79	0	0
2002	214198.03	71493.67	0	0
2003	210530.22	98943.57	0	0
2004	225667.87	103748.47	0	0
2005	221039.47	153555.86	0	0
2006	229718.83	150441.73	0	0
2007	240581.86	156957.33	0	0
2008	220594.26	143140.99	0	0
2009	207336.27	141979.22	0	0
2010	220087.19	151712.74	0	0
2011	215931.6	145542.18	0	0
2012	214452.11	143929.11	0	0
2013	211453.85	145684.26	16030.57	0
2014	208010.04	125226.58	112264	36962.47
2015	220112.33	104238.96	160215.77	86396.9
2016	213532.93	83638.31	146233.98	85638.76
2017	208566.28	78297.95	135521.55	85885.46
2018	215129.01	54281.35	115355.42	85397.79
2019	204234.82	38242.35	176854.16	82959.45
2020	200655.38	20099.24	157233.96	88921.02
2021	212268.19	6033.69	156741.06	92420.79

Source: Statement of Myanmar Petroleum and Natural Resources Department, MOGE.