ERIA Research Project Report FY2023 No. 02

Oil and Gas Strategic Pricing in Myanmar

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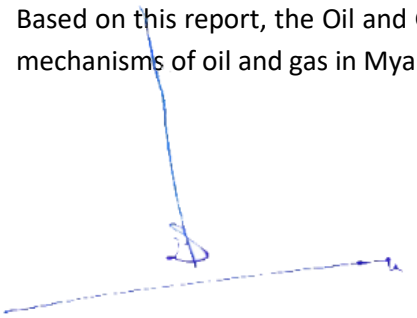
Preface

Oil and gas are very important for Myanmar's energy market; according to the 2019 national energy balance table, 45% of the total primary energy supply was oil and gas and the remaining was biomass at 46%. Myanmar still produces a small amount of crude oil, with some being exported and the remainder refined locally. Thus, 96% of petroleum products such as gasoline and diesel oil are imported, mainly from Singapore, with the price of petroleum products fully linked to Singapore petroleum product market prices. However, Myanmar has a plan to construct a large refinery in the near future.

Regarding gas, 73% of Myanmar's production was exported to Thailand and China in 2019. The primary internal use of gas is power generation, followed by industry. However, gas production is expected to decline year by year, leading Myanmar to import gas for its future internal use according to the Gas Master Plan for Myanmar, prepared by ERIA (2018).

To cope with changing oil and gas circumstances, Myanmar needs new pricing mechanisms of oil and gas markets. These entail a national price index under a mix of domestic and imported petroleum products in Myanmar's petroleum market, and a national price index under a mix of domestic and imported gas or liquefied natural gas at Myanmar's gas market.

Based on this report, the Oil and Gas Planning Department will formulate new strategic pricing mechanisms of oil and gas in Myanmar.



His Excellency U Myo Myint Oo
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Acknowledgements

Energy is an intermediate good as well as final product and prices should distinguish between the producers and consumers. Energy pricing represents a major instrument of the overall energy policy of any country. Myanmar is an importer of petroleum products; therefore, it has little ability to control their cost. This study is designed to research a given field at the same time that it is changing.

On behalf of the Ministry of Energy, I am especially grateful the Economic Research Institute for ASEAN and East Asia (ERIA). Likewise, I also have my sincere thanks to the authors from the Institute of Energy and Economics, Japan (IEEJ) and ASIAM RI for their contribution towards the preparation of this thematic report.

Special acknowledgements are also given to Shigeru Kimura of ERIA and his team for their excellent contribution to this project.

Here, special thanks goes to the Oil and Gas Planning Department for their leading role in this regard. I also appreciate the Steering Committee and Working Group members of the Oil and Gas pricing policy in Myanmar participating in this research. I do believe that this report will be useful for the regulation of domestic oil and gas price levels, and it would ideally be suitable for government policy investment frameworks.

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List of Abbreviations and Acronyms

b/d	barrel per day
bcf	billion cubic feet
bcm	billion cubic metres
BBtud	billion British thermal unit per day
CCR	Catalytic Cracking Reformer
CDU	Crude distillation unit
FCC	Fluid Catalytic Cracking
FOB	Free-On-Board
IEEJ	Institute of Energy Economics, Japan
JLC	Japan LNG Cocktail
JPEC	Japan Petroleum Energy Centre
LNG	Liquefied Natural Gas
MBtu	Million British Thermal Units
MK	Myanmar Kyat
MPE	Myanmar Petroleum Enterprise
Mtoe	Million tonnes of oil equivalent
Mtpa	million tonnes per annum
RFCC	Residue Fluid Catalytic Cracking
SPM	Single point mooring
S&P	Standard & Poor's
VDU	Vacuum Distillation Unit
VLCC	Very Large Crude Carrier

Executive Summary

The petroleum market in Myanmar is fully related with the Singapore spot market since imported gasoline and diesel oil constituted 95% of total petroleum consumption in 2019. As a result, Myanmar Petroleum Enterprise will construct a new refinery that will refine 5–10 Mtoe of imported crude per year, or 100,000–200,000 barrels per day. Once the new refinery is in operation, the Myanmar petroleum market will be a mix of domestic and imported products. Thus, Myanmar's petroleum price index will need to refer to both markets, i.e. the international crude oil market such as West Texas Intermediate and Brent, and the Singapore petroleum spot market. Regarding the competitiveness of the new refinery vis-à-vis Singapore's refineries, the Nelson Index is calculated under some assumptions of secondary equipment capacities such as Vacuum Distillation Unit and Fluid Catalysis Cracking. The Oil and Gas Planning Department of the Ministry of Energy should prepare the price index of gasoline and diesel oil to keep the Myanmar petroleum market competitive.

Myanmar is known for natural gas production, with more than 70% of the produced gas exported mainly to Thailand and China. Internal consumption is for gas power plants and industry, as well as for transport fuel such as compressed natural gas. Currently, gas production is declining, leading Myanmar to import natural gas due to increased domestic usage. The imported gas will be mainly consumed for gas power generation. Since the Ministry of Electricity negotiates electricity purchase prices with Independent Power Producers that import and consume gas for their power generation, this does not reflect the Myanmar gas market. Since some of imported gas will go into industry and transport sectors as combustion fuel, the Myanmar Oil and Gas Enterprise (MOGE) will formulate a basic gas price index based on the domestic gas price and imported price to reflect the international market. Due to increased usage of imported gas, foreign private companies will construct receiving terminals with tanks and regasification equipment, with appropriate regulations on safety and environmental issues set up by the Oil and Gas Planning Department.

Myanmar plans to be carbon-neutral by 2050, meaning gas will be important as a transition fuel. Eventually, Myanmar might export hydrogen instead of natural gas as a result of applying electrolysis technology to its rich hydropower potential. Appropriate gas price mechanisms will contribute to making Myanmar carbon-neutral.

Chapter 1
Introduction

Myanmar, previously an oil-rich country, has seen its production decline year by year; this trend will continue if Myanmar does not find a new oil reserve. Meanwhile, oil demand has increased by an average of 17.9% annually over the last 5 years, reaching 5.9 million tonnes in 2019. Regarding supply, domestic refineries are aging, and production is declining, and Myanmar imports more than 95% of its petroleum products.

Under these circumstances, Myanmar Petroleum Enterprise (MPE), a state-owned refinery company, plans to build a new refinery with an annual production capacity of 5 to 10 million tonnes (100,000– 200,000 barrels a day). When the new refinery goes into operation, it will compete with petroleum products imported by private oil companies. In this regard, it is important to study strategic pricing of petroleum products supplied from the new refinery.

Research into Myanmar's oil distribution structure confirmed that there is a strong relation with the retail price by city and the spot price in Singapore. This means that a new refinery will have to compete with oil import cost of insurance and freight prices. Depreciation costs, utility costs, maintenance costs, labour costs, etc., are important for the competitiveness of a refinery. In addition, competitiveness can be enhanced by increasing the ratio of secondary equipment in the refinery, which increases the yield of high-value-added products. Since the details of the new refinery have not yet been determined, this study used the Nelson Index to propose a facility configuration that would be as competitive as the Singapore refineries. Also, as a reference, a ceiling price system for retail prices, which is activated when crude oil prices and product import prices rise sharply, is presented. Finally, the advantages, and disadvantages of having a refinery in the Myanmar were also summarised, and the precautions of having a domestic refinery listed.

For gas strategic pricing, demand for natural gas in Association of Southeast Asian Nations (ASEAN) countries is expected to grow faster than the total energy requirement in the region in the future. In parallel with the expansion of renewables, the share of natural gas in the energy mix in ASEAN is expected to expand from 21% in 2019 to 24% in 2050, according to IEEJ Energy Outlook (2022). The share of natural gas is also expected to be higher in Myanmar, where domestic gas resources are playing greater roles than in other ASEAN member countries, rising from 21% in 2019 to 35% in 2050.

With modest domestic production growth in ASEAN, Asia's import dependency (including other areas of Asia) could rise significantly from the current level of around 30% to nearly 50% by 2050. Therefore, it is clear that ASEAN needs stable investment in natural gas infrastructure, as well as supply sources from both within and outside of the region.

On a global basis, liquefied natural gas (LNG) plants with significant capacity have started operations in recent years and the world is expected to see further significant expansion of production in the next decade, following the sanctioning of 184 million tonnes per year of

capacity from 2017 to the first half of 2022. Notably for those projects that got final investment decisions during the period, more than half of assumed volumes have not decided on final destinations. Those new projects will compete for LNG customers, as well as against existing projects vying for contract renewals.

In other words, this creates additional opportunities for LNG players to make the market more flexible and contract prices more attractive. In the past, LNG used to be marketed and sold to ready users; the value chain was vertically integrated. Nowadays, those who have LNG may leverage their expertise to develop emerging markets and optimise volumes between different international markets. For example, Japanese LNG importers who have additional volumes, trading houses and upstream developers have been already active in other countries, (notably including ASEAN countries, including Myanmar) to create additional demand, sometimes competing and sometimes collaborating with players from other countries. This could significantly increase LNG consuming points to make market activities more flexible. Increasing transactions between a greater number of players should make it less difficult for them to create Asia's own LNG price indexes.

Although there are many challenges, such as the balance between LNG value chain vertical integration and increasing transaction flexibility, as well as the credit ratings of diversified parties, and different technical standards in different countries, Japanese players are expected to continue contributing to the development of the LNG market, in collaboration with national and private energy companies, and regional organisations, in the ASEAN region.

Due to the COVID-19 pandemic, the global LNG and natural gas industry has experienced a very turbulent period, starting from extremely low spot prices in the first half of 2020, stagnant project development activities with few investment decisions in the year, extreme volatility of spot LNG prices at the beginning of 2021, and culminating with the persistently expensive prices after the second half of the year.

During the past turbulent years, the world again learned that LNG was the most versatile energy source to respond to global energy needs. At the same time, the industry is observing growing awareness of the upcoming energy transition. The industry, as well as governments, will have to find ways to align economic prosperity and energy transition with cleaner energy sources. Myanmar also took advantage of competitive spot prices to introduce LNG in the country in 2020, and later experienced the difficult market conditions in 2022.

Chapter 2
Oil Strategic Pricing in Myanmar

1. Current Situation of Oil Market in Myanmar

1.1. Oil Supply and Demand

Table 2.1 shows supply and demand of Myanmar petroleum products in 2019, with total consumption of petroleum products in 2019 is 5.937 Mtoe, and mostly covered by product import.

Of the 5.860 Mtoe imported, diesel oil accounted for 3.887 Mtoe (66.3%) and gasoline for 1.781 Mtoe (30.4%), and these two products accounted for 97% of the total.

Table 2.1. Oil Supply and Demand in 2019

(Unit: 1,000 tonnes)

	Gasoline	Jet fuel oil	Diesel oil	Fuel oil	Total
Import	1,781	192	3,887	0	5,860
Production	50	11	95	20	176
Export (banker)	0	69	1	0	70
Statistical difference	3	0	-32	0	-29
Consumption	**1,834**	**134**	**3,949**	**20**	**5,937**

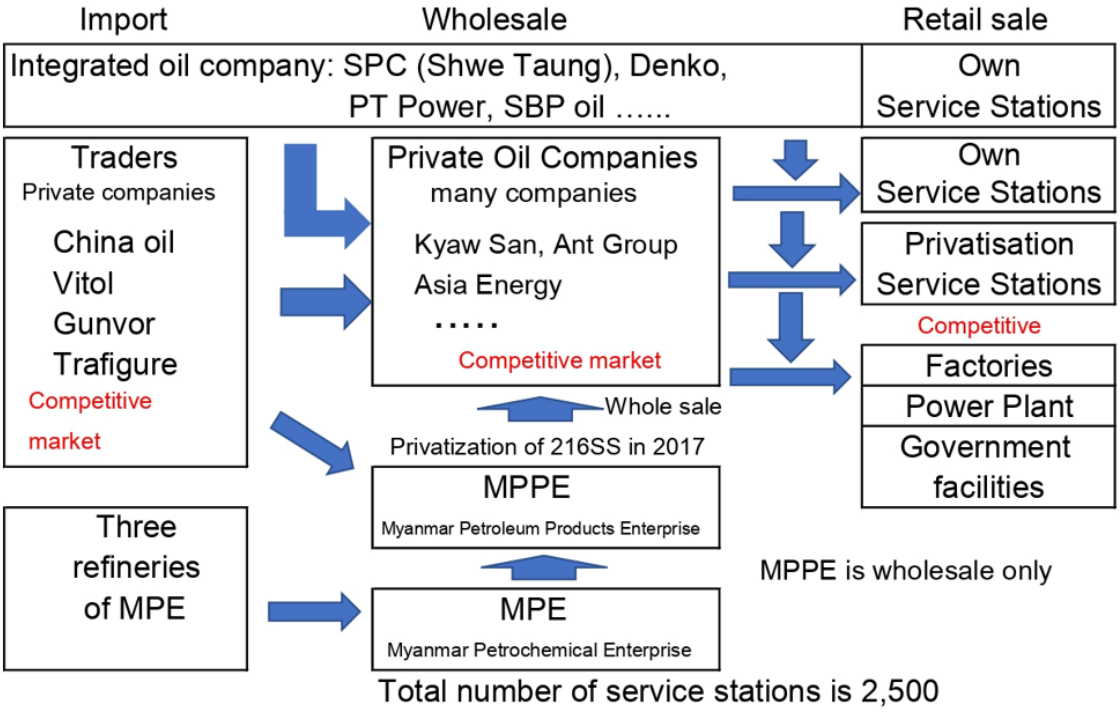
Source: Energy Balance Table (IEA, July 2021).

The petroleum product production of domestic refineries is small at 176 ktons in total, accounting for 3% of consumption.

1.2. Structure of the Oil Industry in Myanmar

Figure 2.1 shows the structure of the oil industry in Myanmar.

Figure 2.1. Structure of Oil Industry in Myanmar



SPC = Singapore Petroleum Company; SBP = Shwe Byain Phyu; MPPE = Myanmar Petroleum Products Enterprise; MPE = Myanmar Petrochemical Enterprise.
Note: An integrated oil company is a company that comprehensively operates import, wholesale, and retail operations.
Source: Authors.

Amongst the oil importers, there are integrated companies that own storage tanks, tank trucks, and service stations and also act as wholesalers; others serve only one of these functions.

The state-owned Myanmar Petroleum Products Enterprise (MPPE) also procures petroleum products from MPE and foreign oil traders, and wholesales them to oil dealers and service stations.

When a new refinery enters the petroleum market, it will require efficient logistics according to the location of the refinery:

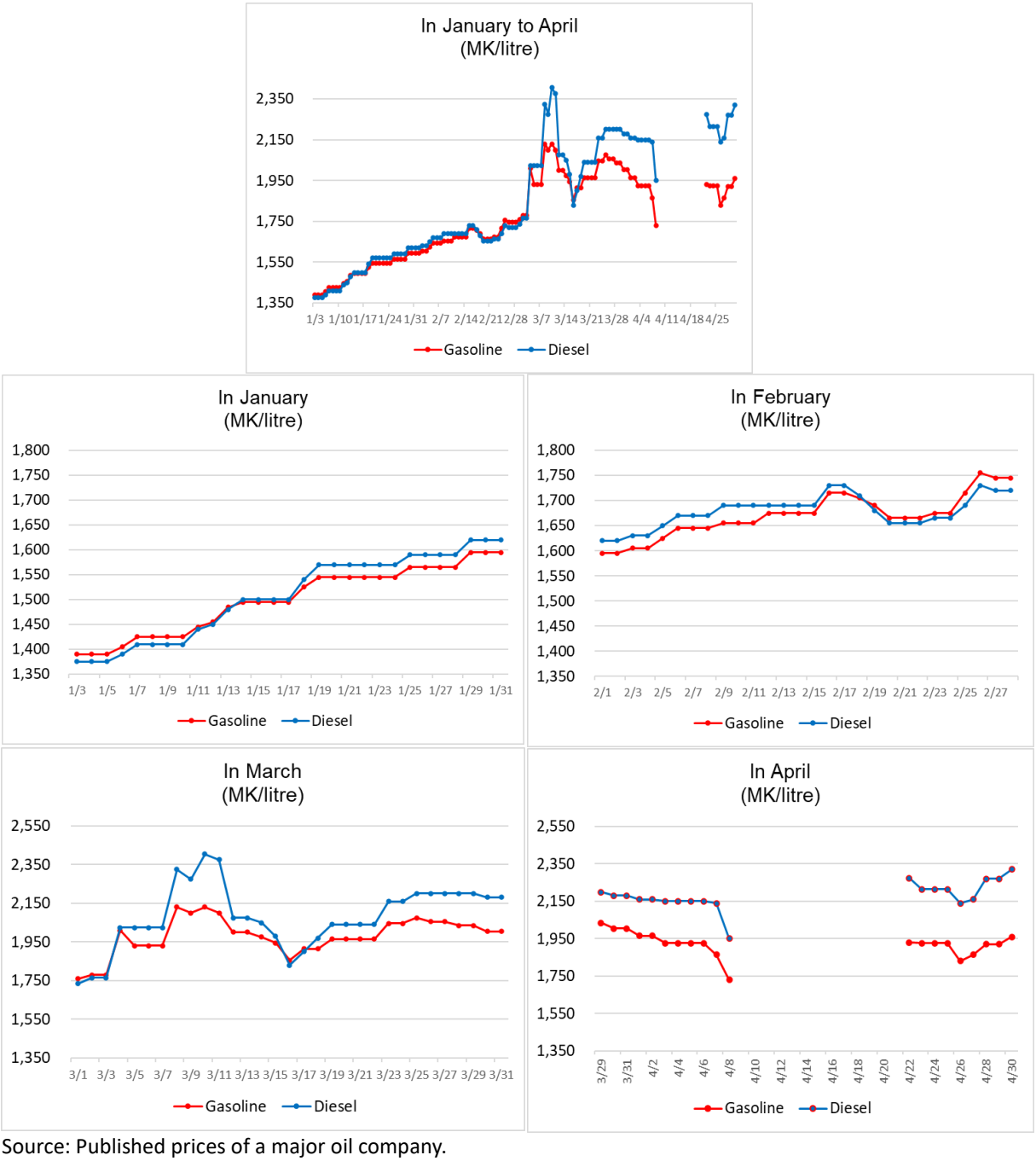
1. Oil-importing companies transport existing petroleum products to the new refinery.
2. The new refinery itself transports petroleum products to their destinations.

2. Pricing of Petroleum Products in Myanmar

2.2.1. Retail Price of Gasoline and Diesel Oil

Figure 2.2 shows retail price of gasoline and diesel oil in Yangon from January to April in 2022.

Figure 2.2. Retail Price of Gasoline and Diesel Oil in Yangon from January to April 2022



Source: Published prices of a major oil company.

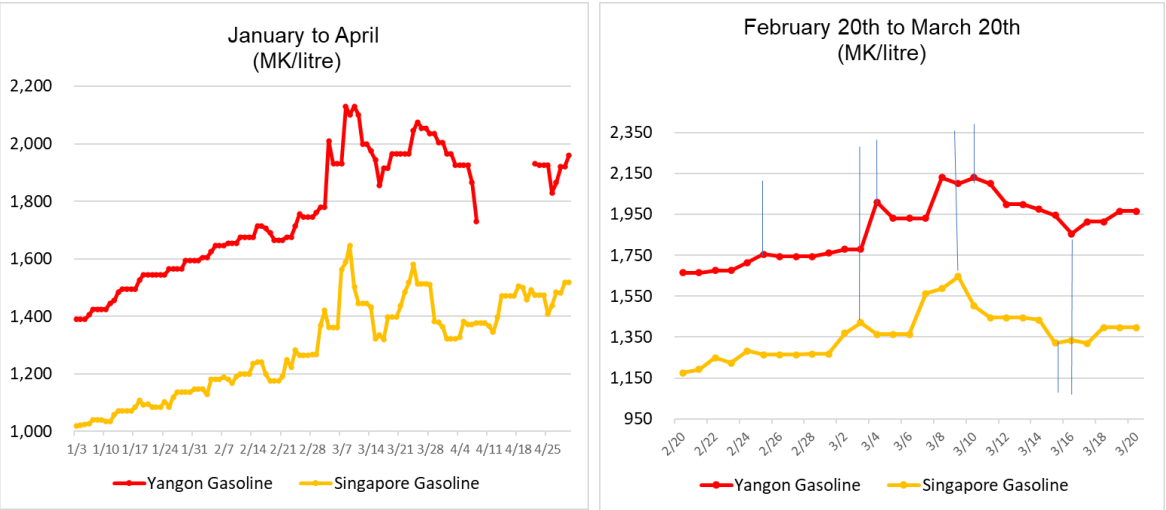
Gasoline prices in Yangon rose from MK1,390 on 3 January to MK2,130 on 10 March. Diesel oil price in Yangon rose from MK1,375 on 3 January to MK2,405 on 3 January.

After that, they fell slightly, but no price information was available between 9–21 April. There seems be some confusion in the market. In May, the gasoline price was around MK2,200, and the diesel oil price around MK2,300. In June, there was no change in the gasoline price, but diesel was around MK2,500. Prices remained high in July and August; moreover, the MK/$ rate fell from 1,860 to 2,100 on 12 August, and gasoline prices at the end of August were around MK2,400 and diesel oil prices were around MK2,800. Note that diesel oil prices are higher than gasoline prices.

2.2. Relation between the Retail Price and Singapore Spot Price

The fluctuations of the retail price of gasoline are linked to the Singapore spot price. Changes in Singapore spot prices appear to be reflected in retail prices after a few days. The discrepancies reflect the Singapore spot price because of import and other tax increases. Figure 2.3 shows the changes in the retail gasoline price in Yangon and the spot price in Singapore from January to April 2022. To see the relationship in detail, the graph on the right shows the transition from 20 February to 20 March. If there is a change in the Singapore spot price, it will be more clearly understood that it will be reflected in the Yangon retail price after a few days.

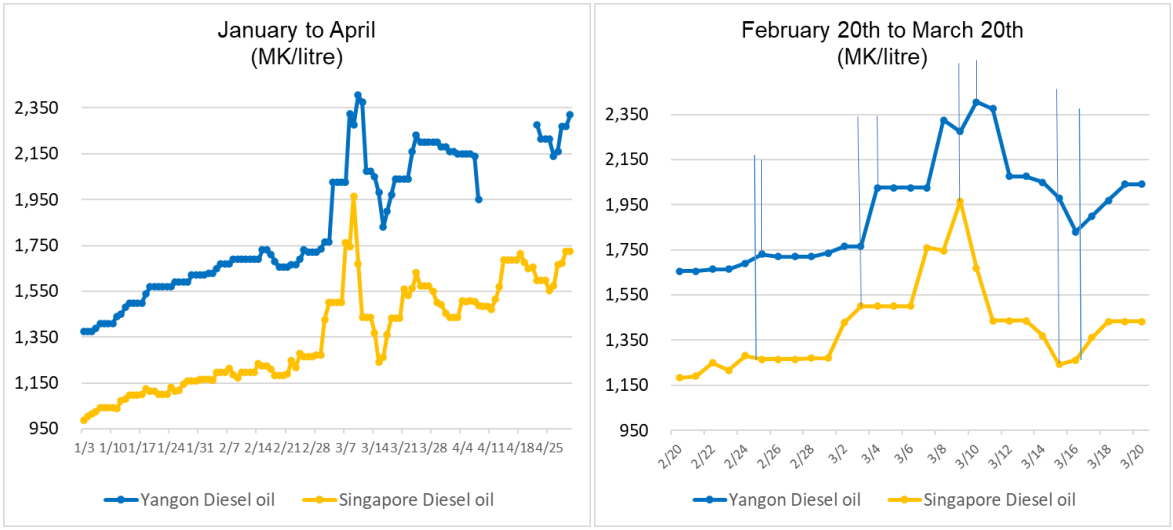
Figure 2.3. Yangon Retail Price and Spot Price of Singapore of Gasoline



Source: Authors.

The relation between the retail price of diesel oil and the Singapore spot price is the same as with gasoline, as shown in Figure 2.4. Changes in Singapore spot prices appear to be reflected in retail prices after a few days.

Figure 2.4. Yangon Retail Price and Spot Price of Singapore of Diesel Oil

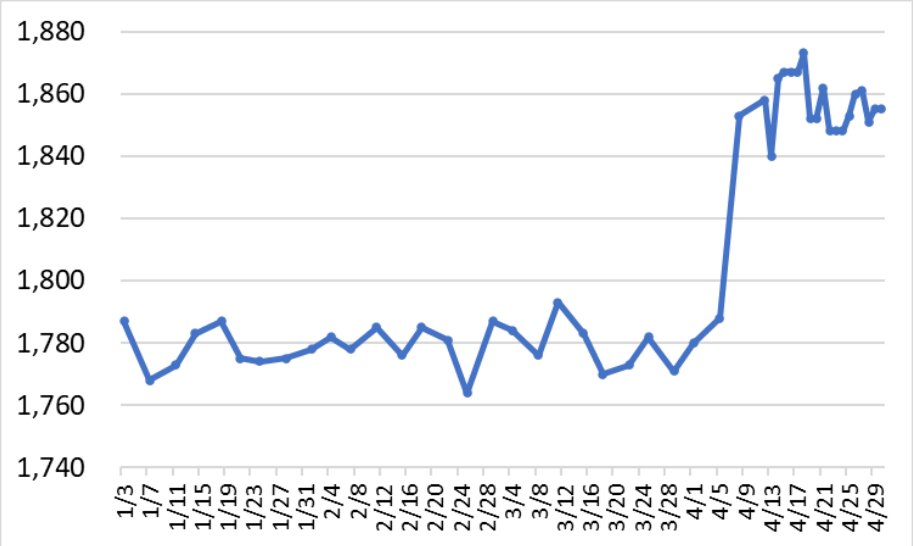


Source: Authors.

Since Singapore spot prices are denominated in dollars, fluctuations in the Myanmar kyat rate affect retail prices. In other words, when the kyat falls, the retail price rises.

Figure 2.5 shows the trend of exchange rate from January to April. The drop in the kyat since the beginning of April has been a factor in rising retail prices. Since August 12, the kyat has fallen further to MK2,100/$1 (as of October 6).

Figure 2.5. Exchange Rate
(MK/$)



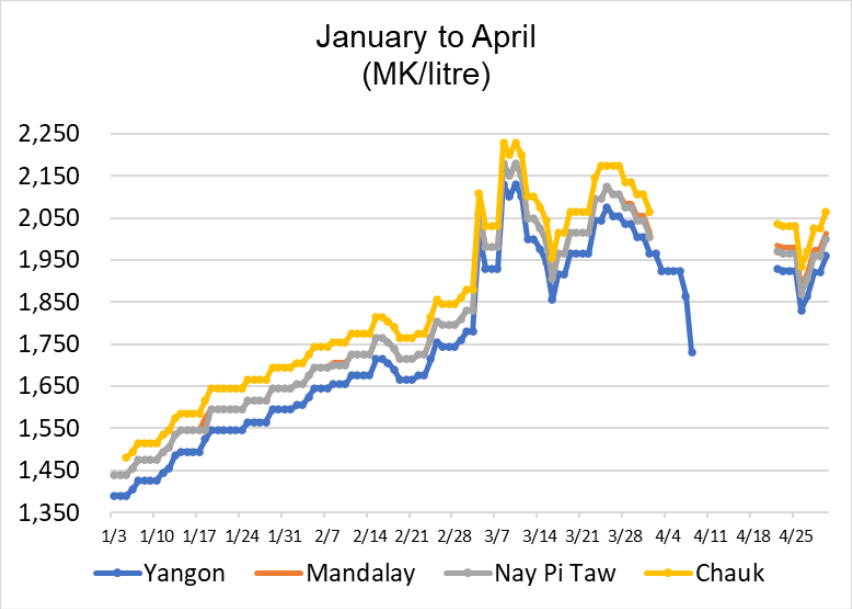
Source: Exchange-Rates.org, (2022) MBH Media, Inc. http://mbhmedia.com/.

2.3. Difference of Retail Price by City from Yangon

2.3.1. Gasoline Price

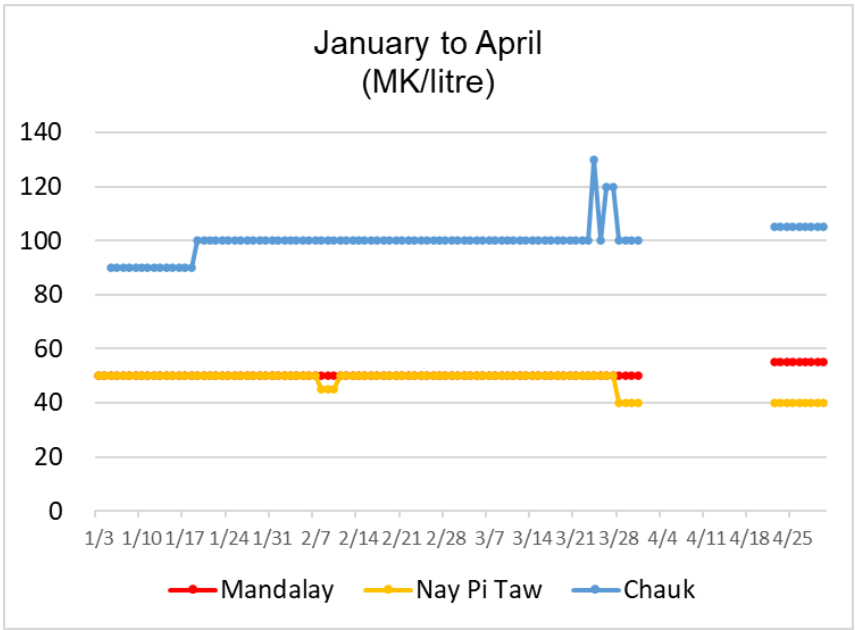
Figure 2.6 shows how gasoline retail prices fluctuate by city in the same way. The difference in gasoline price by city is almost constant compared with the price of Yangon (Figure 2.7). The reason seems to be the difference in transportation cost.'

Figure 2.6 Gasoline Retail Price by City



Source: Authors.

Figure 2.7 Difference of Gasoline Retail Price by City from Yangon

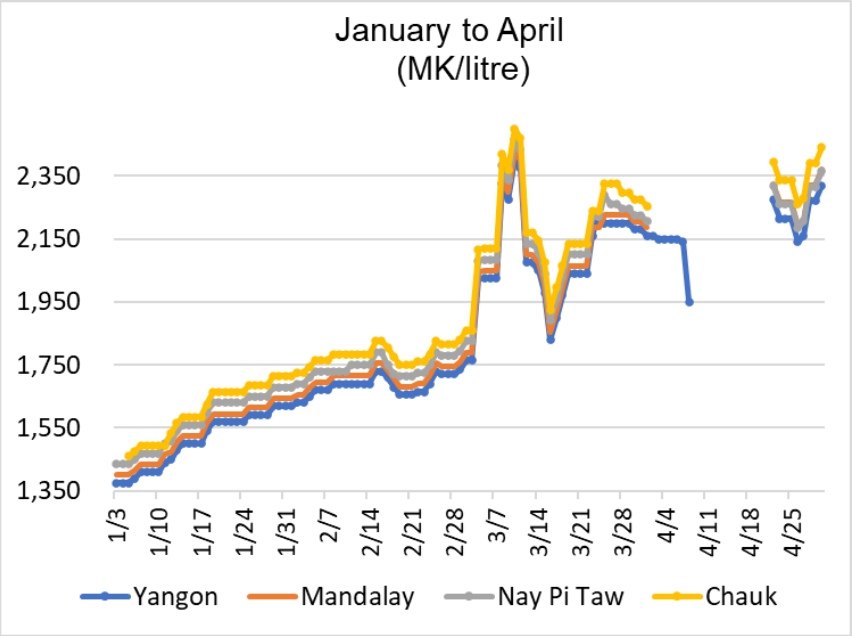


Source: Authors.

2.3.2. Diesel Oil Price

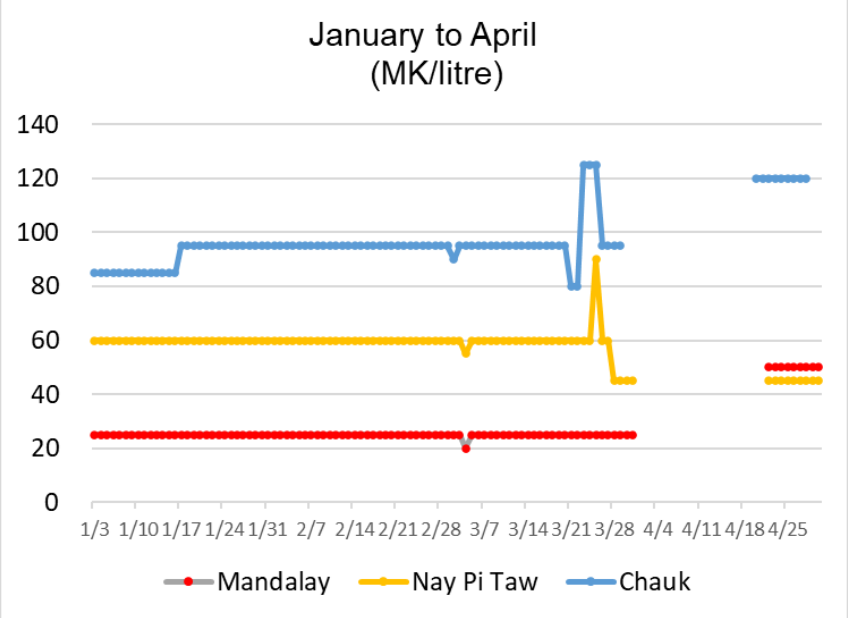
Figure 2.8 shows changes in diesel oil retail prices by city, and how they fluctuate in the same way. The difference of diesel oil price by city is almost constant compared with the price of Yangon (Figure 2.9). As with gasoline, the reason seems to be the difference in transportation cost.

Figure 2.8. Diesel Oil Retail Price by City



Source: Authors.

Figure 2.9. Difference of Diesel Oil Retail Price by City from Yangon



Source: Authors.

2.4. Ceiling Price System

If the domestic oil market is in a competitive state, retail prices will settle at an appropriate level, but when the import prices rise sharply or exchange rates fluctuate sharply, policies such as a ceiling price system may be effective. It is conceivable for the Government to announce the ceiling retail price on a weekly basis. Since it is difficult to inform ceiling retail price to all service stations every day, a weekly basis is preferable.

The basis of the calculation is the Singapore spot price or the average weekly cost with insurance and freight (CIF) price of gasoline and diesel oil. The Singapore spot price is that at the time of spot purchase, not the actual purchase price of the term contract. However, it can be used as an indicator. The ceiling price includes import tax, cost and margin, specific goods tax, and commercial tax. Costs and margins are set based on fact-finding, but they may be difficult to ascertain.

Service stations or oil companies with small sales volumes have large per-litre costs. The problem is that cost savings only go toward reducing labour and safety costs. It is impossible to set a ceiling price that all service stations and oil companies are satisfied with since they all have to cut costs. Whether or not to set a ceiling price for each major city is an issue.

Table 2.2 shows the structure of ceiling retail price, while Table 2.3 shows the total costs and margins calculated from average CIF prices and average retail prices for January and February.

Table 2.2. Structure of Ceiling Retail Price

<table>
<tr><td colspan="2" rowspan="2">Singapore spot price (Platts Singapore) or
CIF price (FOB+Insurance+Freight)</td><td>S&P Global Platts</td></tr>
<tr><td>Information from customs</td></tr>
<tr><td colspan="2">Import tax: CIF×1.5%</td><td>Calculated</td></tr>
<tr><td rowspan="3">Cost and margin</td><td>Wholesale cost and margin</td><td rowspan="3">Based on a fact-finding survey</td></tr>
<tr><td>Transportation cost from oil terminal to SS</td></tr>
<tr><td>Retail cost and margin</td></tr>
<tr><td colspan="2">Specific goods tax : 5%</td><td>Calculated</td></tr>
<tr><td colspan="2">Commercial tax : 5%</td><td>Calculated</td></tr>
<tr><td colspan="2">Total</td><td>Calculated</td></tr>
</table>

CIF = Cost, Insurance, and Freight (conditions including freight and insurance).
Note: S&P Global Platts is a fully independent and neutral information distribution company that provides index prices for energy and commodity markets.
Source: Authors.

Table 2.3. Retail Price Structure
(MK/litre)

		January		February	
		Gasoline	**Diesel**	**Gasoline**	**Diesel**
CIF price (FOB+Insurance+Freight)		1,139	1,133	1,278	1,269
Import tax: CIF×1.5%		17	17	19	19
Cost and margin	Wholesale cost and margin	207	220	226	241
	Transportation cost				
	Retail cost and margin				
Specific goods tax : 5%		68	69	76	76
Commercial tax : 5%		68	69	76	76
Total (Average of retail price)		**1,499**	**1,507**	**1,675**	**1,682**

Source: Authors.

3. Competitive Conditions for a New Refinery

Currently, two plans are being made to build the following new oil refinery projects, which will give priority to gasoline and diesel oil (Table 2.4).

Table 2.4. New Refinery in Myanmar

No	Refinery name	Capacity	Place
1	Thanlyin Refinery Petrochemical Complex	10 million tonnes of crude oil per year (200,000 barrels per day)	Yangon Division
2	Thanbayakan Petrochemical Complex	5 million tonnes of crude oil per year (100,000 barrels per day)	Magway Division

Source: Ministry of Electricity and Energy (2022).

3.1. Overview of the New Refineries

3.1.1. Thanlyin Refinery

Issues with building the Thanlyin Refinery include dismantling and site cleaning the current refinery, insufficient freshwater resources, its location in a crowded area, and accessibility (water depth of the Thanlyin Refinery Harbour is only about 7 m, meaning less practical single point

mooring methods will be needed to accommodate Very Large Crude Carriers [VLCCs]). The Thanlyin refinery is located in the Yangon division, close to a large consumption area, but at the same time it will compete with existing petroleum product import bases, so logistics competitiveness is also necessary.

3.1.2. Thanbayakan Refinery

Issues with building the Thanbayakan Refinery include its size (the current harbour jetty will need to be expanded to accommodate it), its location on the Irrawaddy River, which may have transport difficulty in summer, and the need to buy land to build a rail route or whether a right of way is needed in case the product pipeline is connected to the demand centre. Safety must be considered because of the proximity of the new refinery and the original refinery. While Thanbayakan Refinery is 550 km away from Yangon, it is located near Nay Py Taw and Mandalay, where demand is high. Therefore, it will have an advantage over Thanlyin Refinery in terms of supplying petroleum products to inland areas. Regarding crude oil supply to the Thanbayakan Refinery, it may be conceivable to utilise China's crude oil pipeline from the ocean side.

3.2. Competitiveness of the New Refineries

The new refineries need to supply petroleum products at prices comparable to imports. Depreciation costs, utility costs, maintenance costs, labour costs, etc., are important for the competitiveness of a refinery. In addition, competitiveness can be enhanced by increasing the ratio of secondary equipment, which increases the yield of high-value-added products such as gasoline and diesel oil. In short, the equipment configuration of a refinery is the basis of competitiveness.

Since the details of the new refineries have not yet been determined, this study used the Nelson Index to propose a facility configuration that would be as competitive as the Singapore refineries. The index compares the secondary conversion capacity of a petroleum refinery with the crude distillation unit capacity, furnishing a simple number for quantifying and ranking the complexity of refineries. To calculate the index, it is necessary to assess the capacities of the refinery. In addition, increased production of basic petrochemicals has recently increased refinery competitiveness; however, the Nelson Index does not take this into account.

3.3. Example of Nelson Index for New Refineries

The Nelson Index of the three Singapore refineries in 2020 is 3.08, and the sample equipment configuration for the new refineries to achieve the same Nelson index is shown in Table 2.5.

Table 2.5. Nelson Complexity Index

(Barrels per day)

Name of equipment	New Refinery (1)	New Refinery (2)	Complexity factor	Singapore	Japan
Crude distillation unit	100,000	200,000	1.0	1,514,000	3,519,000
Vacuum distillation	25,000	50,000	2.0	343,000	1,559,000
Catalytic reforming	15,000	30,000	5.0	199,000	685,000
Fluid Catalytic Cracking	15,000	30,000	6.0	85,000	983,000
Catalytic hydrocracking	5,000	10,000	6.0	72,000	179,000
Alkylation			10.0	13,000	105,000
Thermal processes			2.8	142,000	141,000
Oxygenates			10.0	–	–
Isomerisation			15.0	–	–
Lubes			60.0	–	–
Complexity factor	**3.45**	**3.45**		**3.08**	**5.25**

Note: Σ (Complexity factor × unit capacity / crude distillation unit capacity) = Nelson Complexity Index
Source: Authors.

3.4. Production Yield of Singapore Refineries

Table 2.6 shows the change in the production yield of the Singapore refineries. The Catalytic Cracking Reformer (CCR) increased the production of high-octane base material from naphtha, so naphtha yield decreased, and gasoline yield increased. Further, Fluid Catalytic Cracking (FCC) increased the production of gasoline and diesel oil, and the heavy crude oil was reduced to decrease the production of fuel oil. Since the price of fuel oil is less than crude oil, all refineries intend to reduce fuel oil production.

Table 2.6. Production Yield of Singapore Refineries

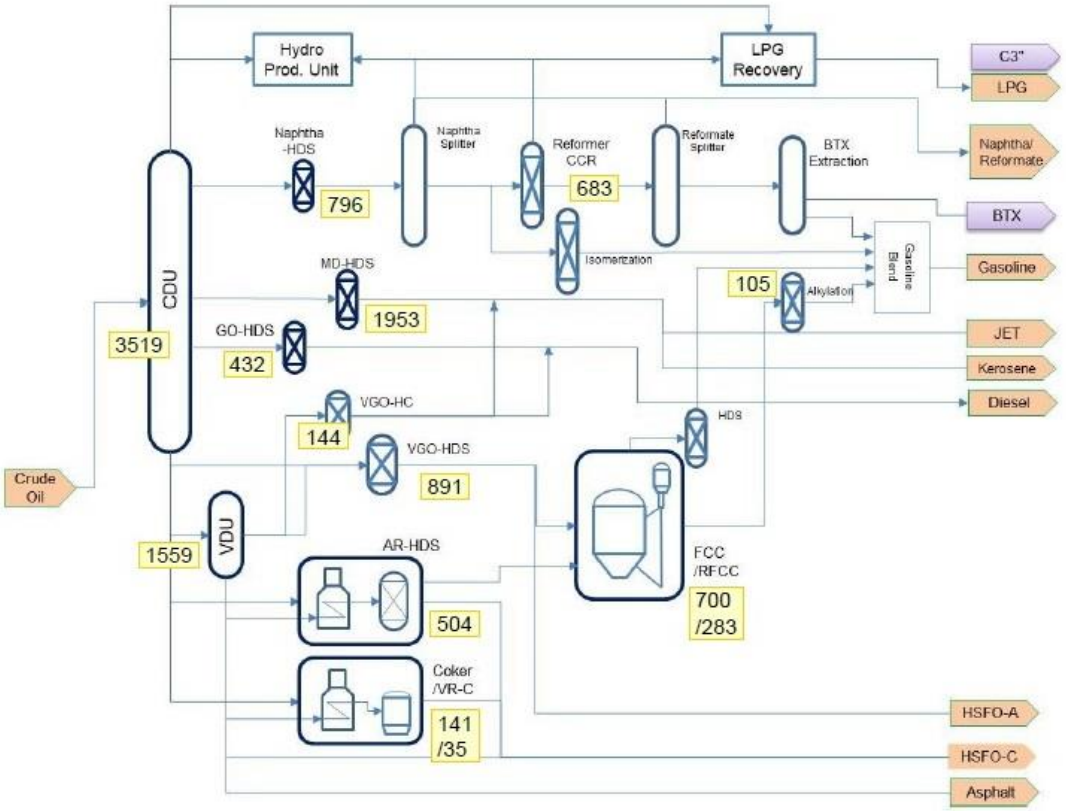
(Unit: %)

	2015	2020
Naphtha	17.0	7.0
Gasoline	11.0	23.0
JET	20.0	21.0
Diesel Oil	28.0	31.0
Fuel oil	11.0	5.0

Source: JPEC Report (2020) https://www.pecj.or.jp/.

For reference, Figure 2.10 shows the equipment configuration and refining flow of Japanese refineries.

Figure 2.10. Refinery Equipment Configuration in Japan



Source: JPEC Report (2022) https://www.pecj.or.jp/.

4. Appropriate Strategic Pricing of the New Refinery

Because the domestic wholesale price of the new refinery will compete with the import price of petroleum products, and the price fluctuation will be the Singapore spot price link, oil companies that own storage tanks in Yangon for imported petroleum products and tank trucks for wholesale and retail sale may not purchase from the new Thanlyin refinery in Yangon without some incentives. Possible incentives are transportation from the new refinery to the oil-importing companies' storage tanks, or oil-importing companies that pick up petroleum products at the new refinery receiving a lower price than import price, or the new refinery itself transporting petroleum products to their destinations with appropriate cost.

In any case, there will be discretion between imported products and refinery products. Equity participation by several major oil companies in new refineries may solve the problems. If the new refinery is located in Thanbayakan, the discount price will be requested considering the transportation cost to Yangon. However, since the Thanbayakan Refinery is close to the inland

area, the difference in transportation costs from Yangon to the inland area is an advantage.

For reference, the method of notification wholesale prices in Japan is as follows. Since Japan is an island country far from the US, Southeast Asia, and the Middle East, it imports crude oil using large tankers and produces petroleum products at domestic refineries. Product imports are a measure to adjust excess and deficiency. Currently, Japanese oil companies notify distributors of wholesale prices on a weekly basis. This reasoning is mainly based on crude oil price fluctuations, foreign exchange fluctuations, and overseas/domestic market price fluctuations, and they notify and negotiate changes from the previous week. When a new refinery enters the Myanmar market, which relies on imports for all petroleum products, it will be necessary to offer the wholesale prices equivalent to the import price. Therefore, the profitability of the new refinery will be calculated based on those prices.

5. Advantages and Disadvantages of Having a Domestic Refinery

5.1. Advantages

- Since the price of petroleum products is higher than the price of crude oil, the difference can be reserved in Myanmar as an added value, and the domestic refinery can increase employment, domestic consumption, etc.
- Since the crude oil market is larger than the products market, the impact of tight supply and demand caused by conflicts, disasters and accidents is small.
- Table 2.7 shows the prices of gasoline, diesel oil, bunker oil and Oman crude oil from January to March. Oman crude oil has the lowest rate of increase.
- In addition, as the price of crude oil rises, the spread with product prices widens.
- Figure 2.11 shows that bunker oil is lower than crude oil price. Reducing bunker oil production increases refinery margins.

Table 2.7. Singapore Spot Price

(MK/litre)

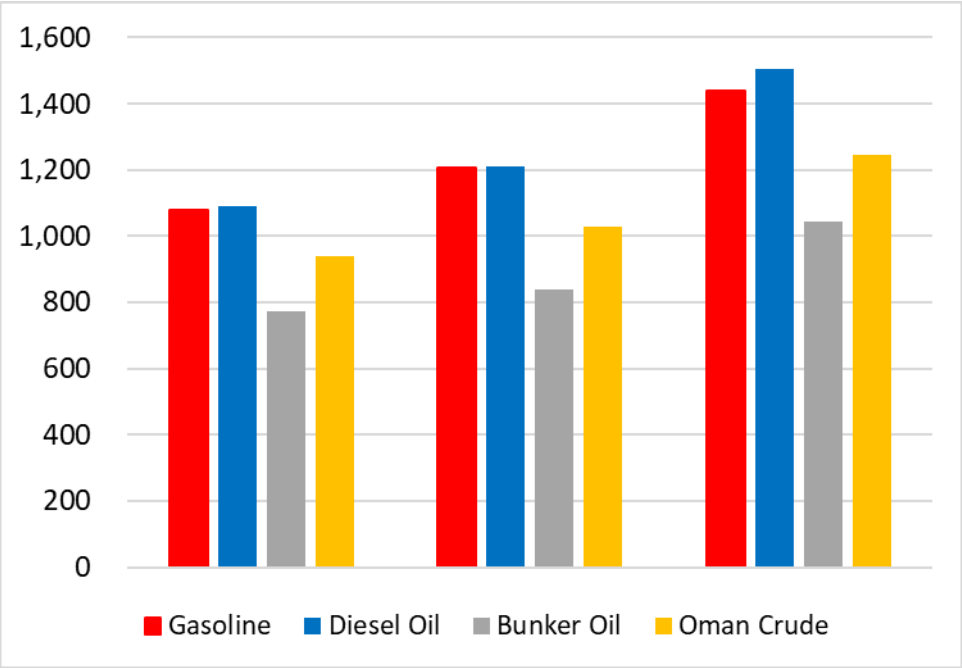
	January	February	March	Multiple Mar / Jan
Gasoline	1,078	1,205	1,438	1.33
Diesel Oil	1,089	1,210	1,506	1.38
Bunker Oil	774	840	1,046	1.35
Oman Crude	939	1,027	1,244	1.32

	Spread from crude oil price		
	January	February	March
Gasoline	139	178	194
Diesel Oil	150	183	262
Bunker Oil	-165	-187	-198

Source: Authors.

Figure 2.11. Singapore Spot Price

(MK/litre)



Source: Authors.

- Long-term stockpiling of petroleum products has a problem of deterioration, but crude oil can be stockpiled for a long time, and there is no problem of quality.
- Crude oil can be imported by large tankers such as VLCCs, and the fare is cheaper than product tankers.
- Considering the demand composition of petroleum products in Myanmar, a condensate refinery using domestic natural gas is also a candidate.

5.2. Disadvantages

- Since the production volume of each petroleum product is set in advance and the properties of the processed crude oil and the equipment configuration are determined, it is difficult to respond if the demand composition changes significantly.
- When the domestic demand in product-exporting countries declines, oversupply of petroleum product export markets will appear, and product prices will go down. Under such circumstances, product imports will be more advantageous and domestic refineries will lose their competitiveness.

5.3. Points to Note

- **Operator training**

  Although the use of computers is advancing, skill is required for the operation of the refinery. Particularly in refineries equipped with many secondary devices, the coordination between devices is complicated, requiring operators to be highly skilled.

- **Regularly maintenance**

  As equipment deteriorates over time, it is necessary to develop a maintenance plan and system. Shut Down Maintenance every 4 or 5 years is also important. It also requires daily inspections by field operators. Early detection of abnormal vibrations, abnormal sounds, oil leaks, etc., can prevent major accidents. If proper maintenance is performed regularly and equipment is repaired or replaced, the refinery can operate semi-permanently.

- **Quality management**

  It is necessary to establish a quality inspection system in order to continuously maintain the products. A laboratory with quality inspection equipment is required within the refinery. In addition, it is necessary to have a system for considering the introduction of additional equipment to improve quality.

Chapter 3
Strategic Gas Pricing in Myanmar

1. Natural Gas and LNG in Myanmar

1.1. Myanmar's Energy and Natural Gas Markets

Myanmar is endowed with natural resources including oil, natural gas, coal, hydropower, and biomass. In 2020, Myanmar's total primary energy supply was 22.67 Mtoe, with biofuels and waste representing the dominant share of 48%, followed by oil (29%) and gas (13%). The power generation was 19.99 TWh in 2020, with hydro power (53%) and gas (35%) being the main sources.

Myanmar was self-sufficient with surface gas on the surface through 2020. However, gas production does not necessarily supply the country's requirements, with large quantities exported to Thailand and China under contracts with developers. The country's natural gas production grew to six times as large as its 2000 level by 2015, but declined by 11% since the peak in 2021. Myanmar began exporting pipeline gas to Thailand and China in 1999 and 2013, respectively.

1.2. Natural Gas Production, Infrastructure, and Consumption

Myanmar has 53 inland blocks in operation, 17 of which are operated by 12 companies, mostly international companies with significant numbers existing from the country. Offshore areas are divided into 51 blocks, 18 of which are in operation, and 24 of which are classified as deep sea.

The existing major offshore gas projects are Yadana Project, Yetagun Project, Shwe Project, and the Zawtika Project. Around three-quarters of the total gas production in the country has been exported to Thailand and China. The Yetagun Project ceased operation in April 2021 due to depletion, with operation briefly back online in the latter half of the year. Myanmar's natural gas system configuration is indicated in Figure 3.1.

Myanmar has 3,500 km of natural gas pipeline length, 45 compressed natural gas (CNG) filling stations, and over 27,000 CNG vehicles. The average domestic natural gas supply is 372 Mcf per day (in FY2021–22). Gas production, consumption, and exports of Myanmar in FY2021–22 are shown in Table 3.1.

Around 90% of total natural gas consumption in Myanmar is for power generation, with the rest used to produce CNG for vehicles, fertiliser factories, and other businesses.

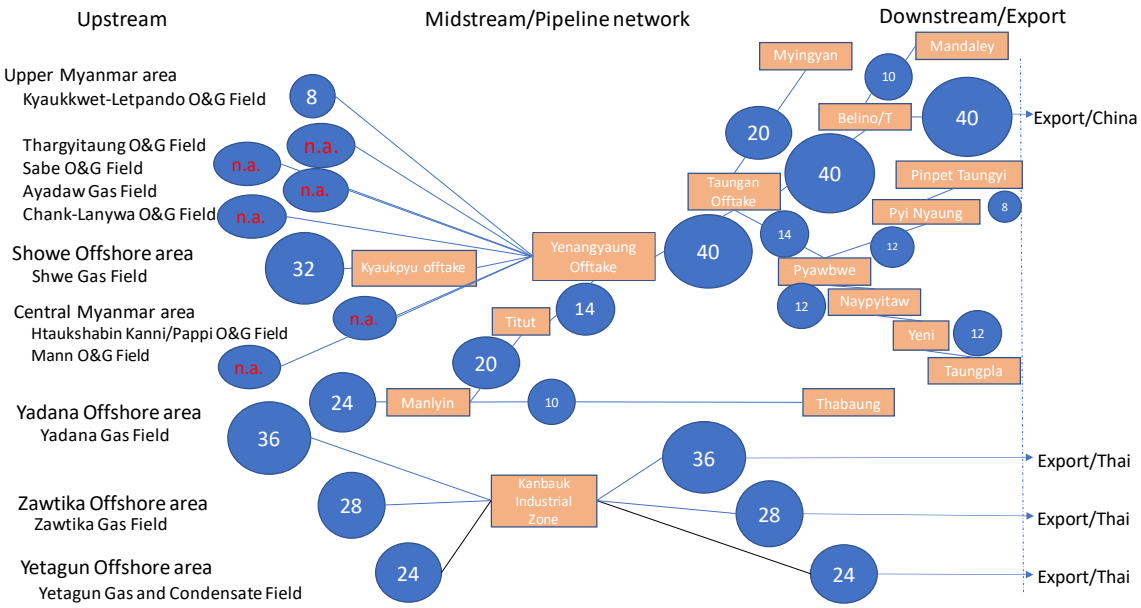
Table 3.1. FY2021–22 Gas Production, Consumption, Export (MMSCF)

Fields	Production	Domestic Consumption							Export	Own Use + Flare
		Electricity	CNG	Refinery	LPG	Industry	Fertiliser	Total Consumption		
Onshore	10,660.71	2,781.91	2,299.23	19.98	936.45	361.01	3,195.52	9,594.11	0.00	1,107.00
Offshore	603,606.88	122,767.47	2,179.50	0.00	0.00	1,242.43	23.83	126,213.23	459,459.50	15,512.28
Total	614,267.59	125,549.39	4,478.73	19.98	936.45	1,603.44	3,219.35	135,807.34	459,459.50	16,619.28

Note: MMSCF = million standard cubic feet.
Source: MOGE (2022).

The export of natural gas from Myanmar to neighbouring countries such as China and Thailand earned over $800 million during the first 4 months of FY2022–23, as stated by the Ministry of Commerce (Global New Light of Myanmar, 2022). Most of this gas is from the Yadana, Yetagun, Shwe, and Zawtika offshore gas fields. Earlier in 2022, TotalEnergies and Chevron announced that they would pull out of the Yadana offshore gas field. Thailand's PTT Exploration & Production (PTTEP) was reported to have taken over TotalEnergies' stake in the field. PTTEP produces and exports natural gas to western Thailand, from the Yadana, Yetagun, and Zawtika fields. Figure 3.1 shows the configuration of Myanmar's natural gas system.

Figure 3.1. Myanmar's Natural Gas System Configuration



n.a. = not available.
Source: Based on information provided by MOGE and illustrated by IEEJ (2022).

Thailand receives 80% of the production of the Yadana and Yetagun gas projects, with the remaining 20% managed by the Myanmar Oil and Gas Enterprise (MOGE).

Earlier, gas export earnings dropped by 11% year-on-year in FY2020–21. The earnings for FY2020–21 are estimated to be about $3.1 billion, compared to $3.5 billion in FY2019–20, according to the figures reported by the Ministry of Commerce (World Bank, 2022). Gas exports are expected to decline in the coming years as production at existing offshore areas begins to slow down and new investment developments are delayed.

Gas exports to Thailand in 2021 were 6.89 million tonnes, up 0.24% from 2020, after a declining trend in the preceding years partly caused by the slowdown in production from the Yadana and Yetagun fields. Exports from Yadana and Zawtika were higher in 2021 compared to 2020, while exports from Yetagun fell significantly.

Thailand's PTTEP is expected to operate the Yadana project after TotalEnergies' exit from it. PTTEP also operates the M-3 offshore block, a joint venture with Mitsui Oil Exploration Company, although the latter notified its intent to exit in September 2021. PTTEP is expected to acquire 100% ownership.

The major stakeholder of the Yetagun project, Petronas' subsidiaries Petronas Carigali Myanmar Inc. (PCML) and PC Myanmar (Hong Kong) Limited (PCML), announced withdrawal from the Yetagun project blocks M12, M13, and M14 in April 2022. Japan's ENEOS also decided to exit the Yetagun project in May 2022.

Australia's Woodside (2022), which discovered natural gas offshore in 2016, also reduced its presence in Myanmar, announcing in January 2022 that it had placed all business decisions in the country under review and will pull out its offshore drilling team.

The authority forecasts MOGE will earn approximately $1.5 billion from oil and gas projects in FY2021–2022, with 50% of the country's foreign currency coming from natural gas revenues (International Trade Administration, 2022b).

1.3. LNG-to-power Policy

In recent years, rapid growth of electricity demand and variability of hydropower output have resulted in significant power shortages in Myanmar. Due to lower rainfall, water levels in the main reservoirs fell, resulting in reduced hydropower output, shifting focus to LNG as a medium-term solution to meet domestic electricity needs. LNG is expected to be the fastest solution through utilising existing gas-fired units.

At the LNG Producer-Consumer Conference 2020, Myanmar's Ministry of Electricity and Energy (MoEE) announced that the country planned to build three LNG-powered plants of 3 GW (LNG Producer-Consumer Conference, 2020). One of the projects has been awarded to a Japanese consortium in line with a government-to-government agreement. In July 2020, three Japanese companies, Marubeni Corporation, Sumitomo Corporation, and Mitsui and Co., together with Eden Group, a local conglomerate group, were granted exclusive development rights to run an LNG-to-Power Plant Project in Yangon Thilawa Special Economic Zone. The 1.25 GW and $1.5 billion project is expected to start operating by 2025.

Myanmar's power generation strategy allows for constructing new pipelines to carry regasified LNG to other parts of the country for industrial uses, especially for fertiliser, cement, and steel production. Myanmar is looking into expanding the LNG terminal facilities to have more trades in the next stage, which will open more opportunities for producers and exporters (LNG Producer-Consumer Conference, 2020).

1.4. Power-related Infrastructure Development

Myanmar has one Thanlyin LNG floating storage unit. In May and June 2020, Myanmar received its first LNG cargos from Petronas. The cargo was shipped from Petronas LNG Complex in Bintulu, Malaysia, on Free-On-Board basis (Offshore Energy, 2020).

This floating storage unit is supposed to transfer LNG to an onshore regasification terminal,

which, in turn, is supposed to supply two power plants in Yangon, 400 MW Thaketa and 350 MW Thanlyin. These were the first facilities where Myanmar used regasified LNG as a fuel source for power generation. The LNG-to-power project was financed, constructed, and operated by CNTIC VPower, a joint venture of China National Technical Import and Export Corporation and Hong Kong's VPower Group.

LNG imported in Yangon was expected to supply another gas-fired power plant: the Thilawa, with 1.250 GW capacity. It is understood to be at the planning stage and is expected to come online by 2024. However, LNG cargoes have not been imported in the country since the second half of 2021.

Several other LNG projects are also being developed. The Ahlone LNG power plant in Yangon is Myanmar's first project that involves an onshore terminal and regasification unit. The purchase price agreement was signed between Electric Power Generation Enterprise under the MoEE and a TTCL Power Myanmar Co in January 2021. The project is expected to be completed in early 2024 and is one of the 3,000 MW LNG-to-power projects (Myanmar Times, 2021).

In May 2021, Myanmar Investment Commission approved 15 projects, including a $2.5 billion LNG-to-power project, which would be the biggest single investment since the military takeover on 1 February 2021. The Commission did not reveal details in the press release, but some sources said the approved LNG project is likely to be the Chinese-backed Mee Lin Gyaing power project in the country's Irrawaddy Delta judging from the cost of the project. China signed a letter of intent with Myanmar's then government National League for Democracy in 2020 to speed up the project development under the Belt and Road Initiative agreement.

The Mee Lin Gyaing project, with a capacity of 1.390 GW, is developed jointly by Yunnan Provincial Energy Investment Group Co. Ltd., UREC, Zhefu Holding Group Co. Ltd. and Supreme Group. It is expected to be complete in 2023; 35% of the power produced will be distributed to Ayeyarwady Region, with the rest going to Yangon via the national grid.

The United Nations warned in April 2021 that Myanmar was approaching economic collapse (United Nations, 2021). Whether these LNG-to-power projects could develop on time depends on how the political and economic stability is restored.

To achieve the country's electrification goals, significant investment in infrastructure development and power generation will be required to increase the current installed capacity of 4.8 GW toward doubling the power capacity.

There should be opportunities for foreign companies that can provide the following support: technical expertise, consultancy, engineering, project management services, building maintenance, and the installation of power plants for oil and gas, renewables, and conventional power sectors. However, the energy sector poses challenges for foreign investors, including unsettled political and economic policies, and unclear rules and guidelines.

Only half of the country's population is connected to the national grid. According to Myanmar Information Management Unit data, 80% of rural people have no access to grid electricity (International Trade Administration, 2022a).

1.5. Power Shortage Problems

Many parts of Myanmar suffered severe power cuts in the first half of 2022. The country typically suffers more frequent electricity outages in summer due to lower supplies from hydro-power plants, but in 2022 the electricity supply situation was worse due to higher gas prices as well as damaged power lines, leading to more disruption. Some gas-fired power plants had paused operations due to higher fuel costs.

MOEE was forced to impose countrywide power cut schedules in March and acute shortages worsened after April. Available power generation capacity declined from 3,711 MW in October 2021 to 2,665 MW in March 2022, and daily output dropped from 73,137 MWh to 51,776 MWh (International Trade Administration, 2022a). Since then, MOEE has approved a hydroelectric dam proposal in Shan State, and reshuffled and restructured the energy and electricity ministerial structure.

As a result, it is going to take longer to get back on a schedule of electrifying the population. The 400 MW Thaketa and 350 MW Thanlyin LNG-fired power plants have suspended operations. Three dams in central Myanmar's Baluchaung region were taken offline due to attacks on the grid, and most of the 29 solar projects approved in 2020 for around 1 GW were cancelled.

In addition, there have been issues of non-payment of electricity bills, with 90% of bills unpaid in February–July 2021; 30%–40% are still unpaid in recent months. This non-payment is estimated to have cost the government $1.5 billion in lost revenues over the course of 2021. Domestically produced natural gas, which is used by public buses and taxis, was supposed to buffer against international oil price volatility. However, CNG filling stations have also been hit by blackouts, and some bus services have had to reduce the frequency of their services.

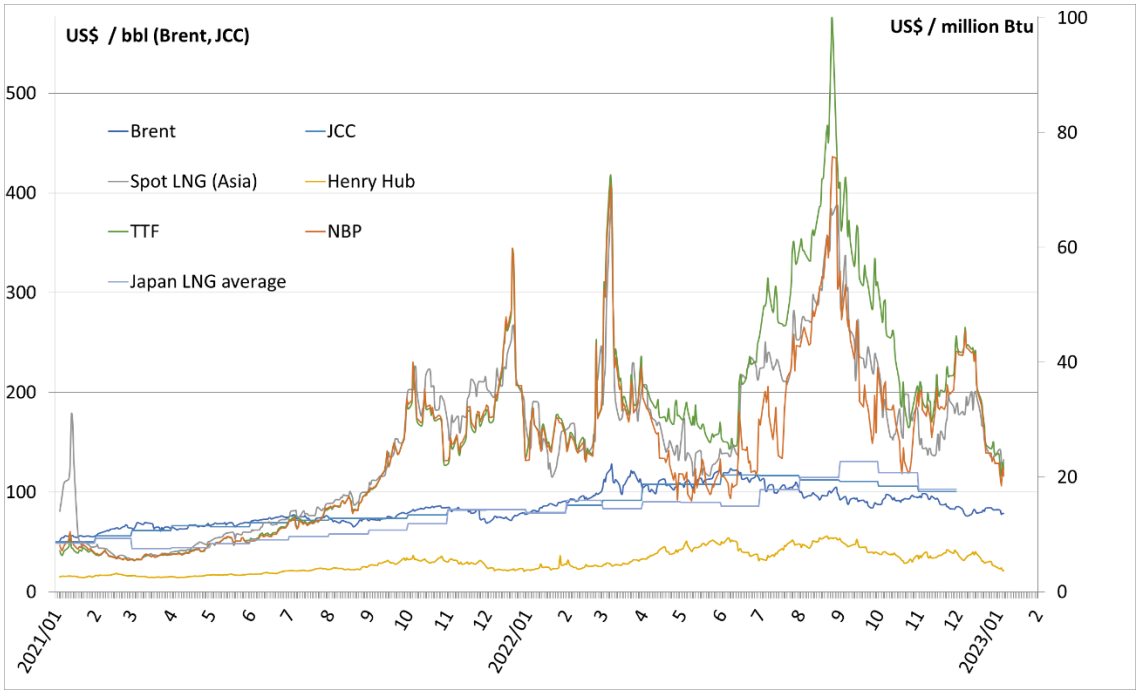
The global energy crisis will continue to keep Myanmar's domestic electric power and fuel prices volatile and more expensive.

2. Global Developments

2.1. The Most Turbulent Year of Gas Prices

In the international markets, LNG and gas prices have been the highest in the history and more expensive than crude oil since July 2021, showing unprecedented volatility. This is the main reason why Myanmar has not been able to secure LNG cargoes. Figure 3.2 depicts selected gas and LNG prices in global markets.

Figure 3.2. Selected Gas and LNG Prices in the International Markets

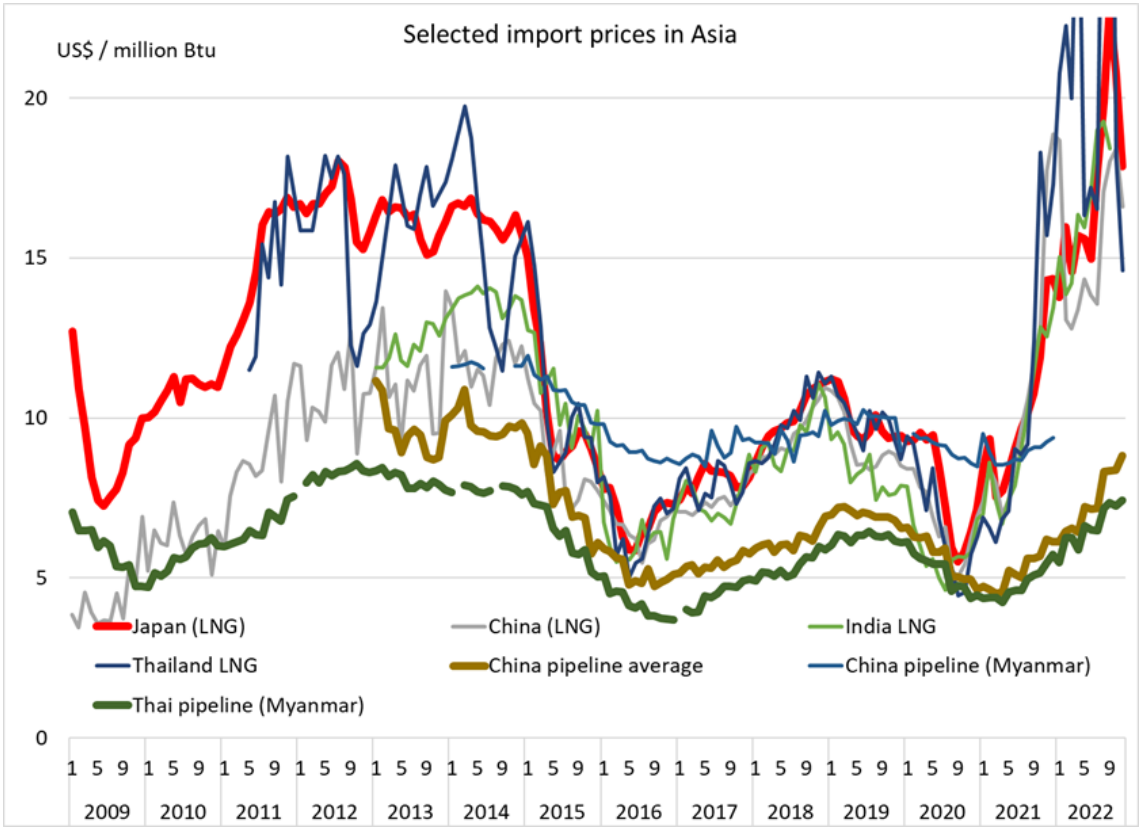


JCC = Japan Crude Cocktail, Japan's average crude oil import price, TTF = a spot gas price representing European Continent gas prices, NBP= a spot gas price representing gas prices in the United Kingdom, US$ = United States dollar.
Source: Based on data of Customs statistics of Japan, commodity exchange marketplaces, ICIS (2022).

2.2. Some Contract Prices Provide Stability

Although spot gas and LNG prices in the international markets have demonstrated extreme volatility, notably toward the upper side, some of the contract prices have proved their stability and predictability in recent years. Figure 3.3 depicts selected import prices of gas and LNG in Asia.

Figure 3.3. Selected Import Prices of Gas and LNG in Asia



US$ = United States dollar; Btu = British thermal unit; LNG = liquefied natural gas.
Source: Based on data of Customs statistics of importing countries (2022).

Gas prices have been shifting toward gas-on-gas competition from traditional oil linkage globally, while in Asia, linkage to oil is still dominant. In the global LNG market, increasing exports from the US have led to recent increases in gas-on-gas pricing transactions.

Potentially tradable and flexible LNG is growing, thanks to more flexible LNG contracts in recent years, as more new LNG projects are coming online in the Asia- Pacific region with buyers' equity participation and, hence, equity lifting arrangements.

More LNG sales and optimisation deals are concluded between portfolio players and Japanese and other Asian LNG buyers without destination restrictions and with different pricing conditions, potentially enabling more flexible movements of LNG cargoes.

With expected increase of the flexible portion under long-term arrangements, more parties are expected to have the ability and desire to potentially bid or offer LNG cargoes in the spot market. In fact, more players have been conducting tenders to buy or sell LNG cargoes, although some tenders do not produce outcomes that those players desire, due to different market conditions.

Lastly, but most significantly, LNG export projects in the US are enhancing flexibility in the global LNG trades, especially from 2017 with destination flexibility and the gas-indexed LNG pricing, along with notable project participation by Japanese and other Asian companies either as off-

takers, investors, or financers. Although at this moment the Asian markets do not benefit from that flexibility, as most of flexible volumes are heading toward Europe, some extra volumes are expected to flow into the Asian markets in the coming years.

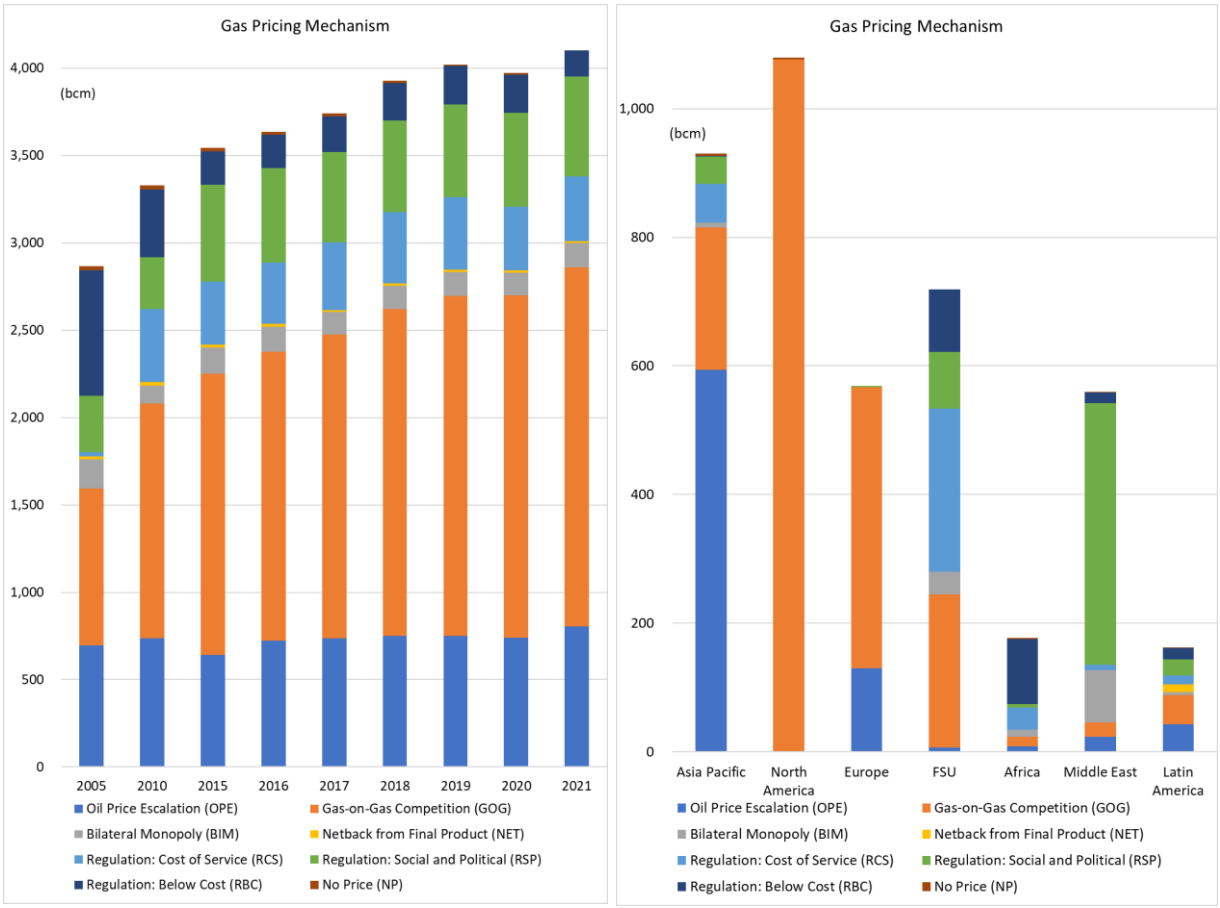
Timely and transparent customs declaration and statistics systems in Japan and other East Asian importers are expected to make future LNG markets in the Asia-Pacific region more visible.

A more comprehensive coverage of bidding and offering information (with some kind of cooperation between Price Reporting Agencies and even government agencies) with easier access by companies with less appetite for trading may lead to more reliable price formation for the spot market.

The industry does not have to solely rely on the spot market prices to establish a fair and equitable LNG price index in the region. Another potential index is the Japan LNG Cocktail (JLC), as Japan's weighted average delivered LNG price for a month. It has been possible to know the JLC for the month by the end of the following month, thanks to timely publication of the customs statistics.

There may be a risk at this moment that the JLC may still fluctuate with volatile movement of crude oil prices, as many Japanese long-term LNG import contracts are indexed with the Japan Crude Cocktail as Japan's weighted average delivered crude oil price. However, in the future, by gradually shifting long-term purchasing contracts from oil-index to JLC-index, the risk may be gradually mitigated, and the JLC-indexed price may move month by month with adjustment made by certain volumes of spot LNG transactions. Figure 3.4 depicts selected import prices of gas and liquefied natural gas in Asia.

Figure 3.4. Selected Import Prices of Gas and Liquefied Natural Gas in Asia

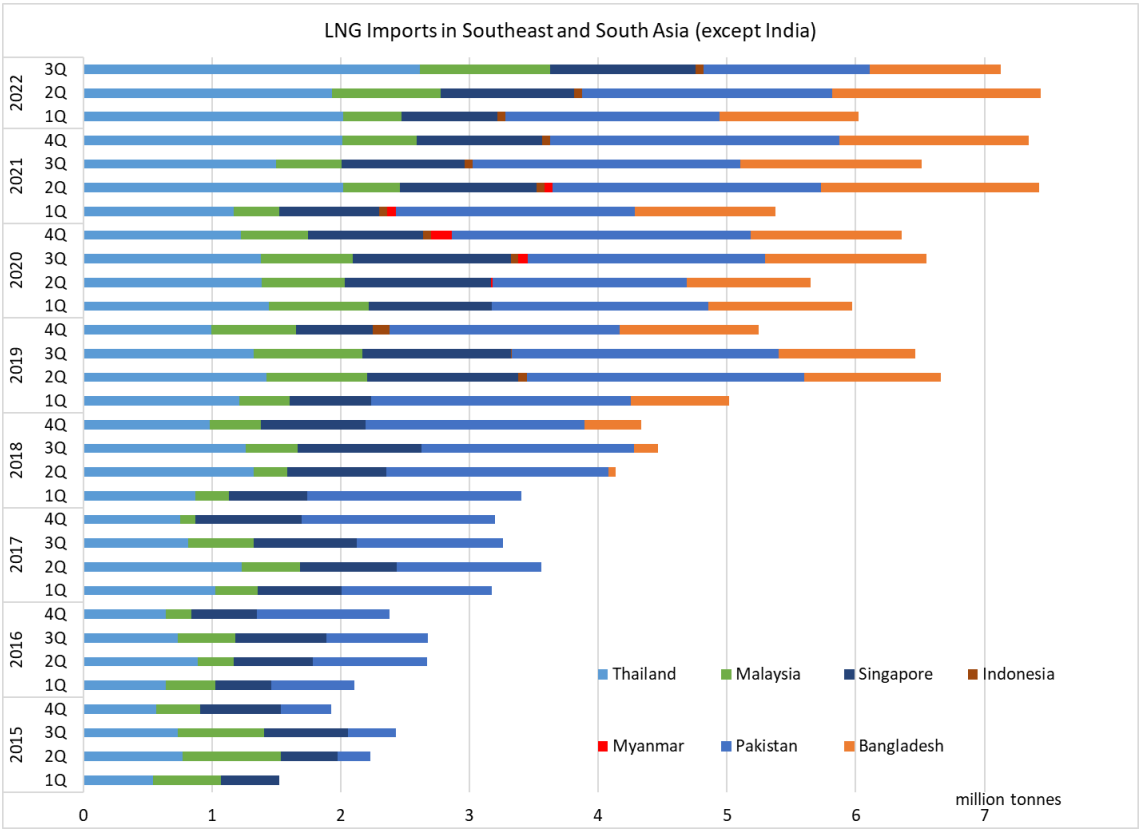


FSU = Former Soviet Union

Source: Based on Wholesale Gas Price Survey (2021), International Gas Union, https://www.igu.org/resources/global-wholesale-gas-price-survey-2021/

While the Asian emerging LNG markets have been growing relatively fast in recent years, they have been sensitive to the international prices and/or influenced by the fluctuations in demand in the other northern hemisphere markets. Figure 3.5 shows the LNG imports in Southeast and South Asia, except India.

Figure 3.5. LNG Imports in Southeast and South Asia (except India)



LNG = liquefied natural gas.
Source: Based on customs statistics of countries (2022).

3. Pathway Forward

3.1. In the Broader Context of an ASEAN Member

ASEAN is a key market for gas demand in the next decades. The substantial potential demand is a huge opportunity for energy infrastructure investments, but it will only materialise under the guidance of appropriate policy to promote quality infrastructure and resilience in ASEAN for sustainability. Governments should investigate the LNG infrastructure gap and place the right policy to promote the investment that will support the increasing demand of gas use. Myanmar is no exception.

Legal frameworks have been identified as one of the main challenges when developing infrastructure. Unclear or restrictive regulations could hinder investment and financing opportunities. Investors do not make investments unless there is a clear legal framework that provides sufficient incentives and return insurance. Myanmar should demonstrate clear support through offering a series of legal frameworks and clear investor guidance, and even approving an LNG terminal or gas-fired power generation project application without delays.

Leaving investment decisions in major infrastructure to market forces has been proven difficult given LNG-related infrastructure projects are capital-intensive. Concrete actions by the government are required for development of infrastructure such as LNG receiving terminals,

regasification plants, storage tanks, gas networks and pipelines or virtual pipelines.

In addition, it has been proven that the cooperation between LNG producer and consumer could also accelerate the infrastructure development. In the case of Viet Nam, several US companies such as AES and Delta Offshore Energy, engaged in the LNG-to-Power projects through financing. The cooperation does not only help facilitate the development of LNG terminals and gas-fired power plants in Viet Nam but also helps exporting from the US, while the major LNG producer seeks more markets. This is the best scenario of a win-win strategy.

In that sense, domestic gas sales pricing should incorporate levels and fluctuations of prices in the international market either directly or indirectly to introduce LNG into the domestic market in a sustainable manner, rather than as an emergency measure, as was done in 2020 and 2021.

However, stability and predictability are important to grow the consuming market. Such pricing would also attract international companies to the country's upstream sector again. It is important to pursue LNG pricing mechanisms that provide comfortable price levels for both consumers and producers.

3.2. Challenges Ahead

It would be difficult to maintain and grow domestic gas production, especially in the absence of international upstream companies, although some foreign companies are expected to stay in the operation. While demand is growing, production does not grow or declines.

It would also continue being difficult to procure supplemental LNG in the expensive and volatile international market. While LNG is expected to fill the gap, prices do not look friendly. Then importers would have to migrate higher procurement costs into the domestic energy market. Domestic gas prices should be set appropriately and strategically.

As risk management measures, fuel switching capability should be incorporated. In the uncertain environment, Myanmar should expand LNG receiving and distribution infrastructure. Myanmar needs to secure LNG Floating Storage and Regasification Units in competition with other regions.

The government needs to provide information on domestic laws and regulations concerning natural gas and electric power, current pricing policies – natural gas and electric power, current major infrastructure – including maps with the capacity data of natural gas pipelines, gas-fired and other power generation facilities, timely natural gas statistics (consumption, production, and import/export by sector, region and company) to attract more investors and potential LNG and natural gas marketers.

Information on decisions and policy measures regarding LNG imports, emergency LNG imports in recent years (since June 2020), and longer-term plans (including Thilawa), as well as natural gas utilisation plans (and past statistics) in electric power generation and industrial use would be also helpful for potential entrants into the market.

Chapter 4
Conclusion and Recommendations

For strategic oil pricing in Myanmar, the retail price is at the level of import prices (CIF) purchased by private oil companies through foreign traders, plus taxes, costs and margins. Import prices are contracted on the Singapore spot price link, with its changes reflected in the retail price after a few days. Therefore, the wholesale price of a new refinery entering the Myanmar oil market will have to compete with the import price. Competitiveness of a refinery can be enhanced by increasing the ratio of secondary equipment, which increases the yield of high-value-added products such as gasoline and diesel oil. in short, the equipment configuration of a refinery is the basis of competitiveness. Currently there are two new refinery projects:Thanlyin Refinery which is 200,000 b/d located in Yangon division, and Thanbayakan Refinery, which is 100,000 b/d located in Magway division. Since the details of the new refineries have not yet been determined, this study used the Nelson Index to propose a facility configuration on Table 2.5 that would be as competitive as the Singapore refineries. Although different in size, the two new refineries will require the installation of secondary units such Vacuum Distillation Unit (VDU), Catalytic Cracking Reformer (CCR), Fluid Catalytic Cracking (FCC), Residue Fluid Catalytic Cracking (RFCC).

In addition to the advanced equipment configuration, the new refinery's challenges include how to enter the petroleum market. It is not difficult for national and private oil companies with large distribution and sales networks to build new refinery and switch from imported petroleum products. If a company without a distribution and sales network builds a refinery and enters the petroleum market, it will need some kind of incentive in terms of price and logistics. Equity participation by several major oil companies in a new refinery may solve the problems. Thanlyin Refinery, which will be built in Yangon district where there are many oil companies' import bases, needs to take this point into consideration. Thanbayakan Refinery, which will be built in Magway district, 550 km away from Yangon, needs to discount the transportation cost when it supplies to Yangon area; when it supplies to inland areas such as Mandalay and Nay Pyi Taw, it will have an advantage in transportation. In any event, when a new refinery enters the petroleum market, it will need to meet the current regional retail price levels.

As mentioned in the Myanmar oil market, the presence of an integrated oil company that handles imports, distribution, wholesale and retail is completely different from Japan. They probably have a large share and are the price leader. Forming a joint venture with such a major integrated oil company to build a new refinery is considered an effective way to facilitate a new refinery's entry into the Myanmar oil market. If the Singapore price moves, the retail price will move two or three days later, and the fact that the retail price of all service stations will be announced online is proof that the integrated oil company is powerful.

This Myanmar pricing mechanism works well. Therefore, the new refinery will be required to supply at the same or lower price than imported products. The integrated oil company's wholesale price should also be notified on the Singapore link, it is a highly transparent pricing

mechanism in a sense.

For gas strategic pricing in Myanmar, the following key findings are extracted:

1. Pursuing natural gas pricing mechanisms that provide comfortable price levels for both consumers and producers continues being the key to the robust development of Myanmar's natural gas resources and market.
2. It is especially difficult to find levels that should be comfortable for both consumers and producers of natural gas in the country.
3. There have been serious issues and obstacles in the natural gas market in Myanmar, starting from shortages of natural gas to generate electricity, slow infrastructure development, withdrawals of international companies from upstream gas development, non-payment of electricity bills, and non-transparent data and policy information.
4. When those issues are solved, there should be hope that domestic gas resources will be developed and fuels into development of the economy.

Based on these findings, we recommend the government (and relevant stakeholders) undertake the following initiatives to support a growing market for natural gas in Myanmar.

1. Pursue natural gas pricing mechanisms that provide comfortable price levels for both consumers and producers:
   a. Comfortable prices should be affordable enough for natural gas consumers in the country, while they should be profitable enough for producers. Producers should reduce the supply cost as much as possible and consumers should appreciate the value of natural gas for providing essential energy supply, as well as its environmental contribution.

2. Future pricing policies should cover both prices in the domestic market (wholesale and retail) and import and export prices.
   a. In the domestic market, the prices should allow reasonable growth of the natural gas consuming market. That should be competitive enough to allow residential and industrial users of natural gas to purchase gas without financial pain. That should be high enough for developers of natural gas resources to recover development costs, as well as for importers of LNG to recover import costs.
   b. As for the import prices, although they simply reflect prices in the international market, they should be competitive enough to be accepted into the domestic market.
   c. As for the export prices, they should be high enough for developers of natural gas resources to recover development costs.

3. The above goals should be in line with data transparency, a general policy of promotion of gas and demand stimulation, and robust infrastructure management to ensure natural gas and electricity supply security.
   a. The country’s laws and regulations concerning natural gas and electric power, pricing policies on natural gas and electric power, as well as information on major infrastructure and statistical information of consumption, production, and import/export by sector, region and company should be critical.

b. Decisions and policy measures regarding: LNG imports - emergency LNG imports in recent years (since June 2020) and longer-term plans (including Thilawa), as well as natural gas utilisation plans (and past statistics) in electric power generation and industrial use should be critical.

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