

1. DME Prospect and Potential Market in Indonesia

(Gundo Susiarjo)

Indonesia DME Outlook

Prospect and Challenges

Seoul, 27 October 2022



How we started and where to go next?

- The Ministry of Energy and Mineral Resources (MEMR) of the Republic of Indonesia published “Energy Investment Project Plan 2021 - 2026” in April 2021 in which DME project is listed as the number 1 priority project to propel the policy of substituting about 7 - 8 million of LPG imports with DME.
- At that time, international LPG price (CP Aramco) was around USD 1,200/MT (USD 26/MMBTU).
- Numerous studies have been done to assess the policy impact in terms of its technicalities, economics and social aspects.
- The planned project is also driven by the outlook of weakening coal market due to CO2 reduction pressure culminated during United Nations Climate Change Conference - COP26 - in Glasgow (October 2021).
- PT Surba Muda and Korean GS Plant met BFI to expedite building a Gas-to-DME plant in Indonesia in 2021. DME Plant could be built with gas sources in Sumatra of 50 MMSCFD, East Java (80 MMSCFD) and in Kalimantan (250 MMSCFD).
- PT Surba Muda and BFI signed a Business Collaboration Agreement on 28 October 2021 to represent Indonesian consortium.
- PT Surba Muda signed a cooperation agreement with PT Isar Gas on 5th November 2021.
- PT Surba Muda initiated a cooperation with PT Bumigas Mitra Sejahtera (BMS) a sizable Central Java gas trader.
- Zoom call with BMS Chairman Mr. Reza Tarmizi on 25 December 2021 and Isar Gas on 07 January 2022.
- Russia-Ukraine War caused price escalation of Crude Oil and Coal. LPG price dropped. This trend has gravely jeopardized DME manufacturing option/feasibility/economics.
- PT PLN (Indonesia’s Power SOE) proposed electric stoves program to replace LPG stoves in August 2022.

Coal Gasification Project into Methanol and DME

In 3 Months, PTBA Starts Working on Coal Gasification

MARKET – Yuni Astutik, CNBC Indonesia 27 January 2021 20:49

2 Coal Gasification Projects Targeted to Operate in 2024

News – Anisatul Umah, CNBC Indonesia 19 March 2021 12:15

Air Products berinvestasi \$2 Miliar sebagai Tonggak Penting Proyek Batubara menjadi Metanol di Indonesia

Air Products Membangun, Memiliki dan Mengoperasikan Fasilitas-fasilitas serta Memasok Metanol dengan kontrak jangka Panjang, Memungkinkan Konversi Sumber Daya Alam menjadi Produk bernilai Lebih Tinggi.

18/105/2020 JAKARTA, Indonesia.

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Bakrie, Ithaca and Air Product Build Rp 30 Trillion Methanol Industry

Based on the long-term contract, coal supplied from mines owned by PT Bumi Resources Tbk (BUMI) and PT Ithaca Resources is then processed by Air Products' production facilities to be produced into methanol and marketed in Indonesia.

Ria Theresia Situmorang – Bisni.com

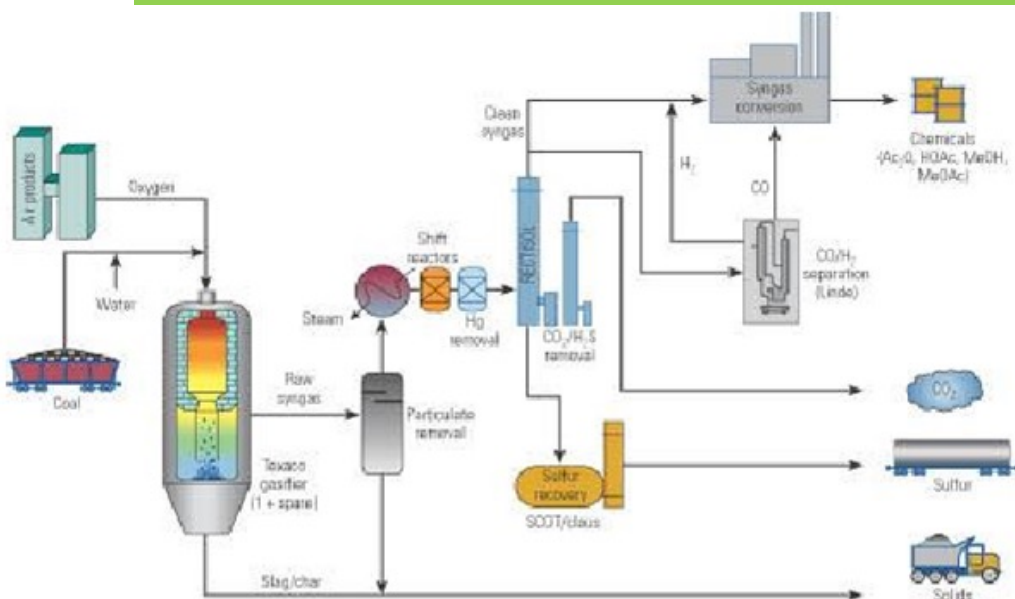
17 May 2020 / 07.35 WIB

Next Year Electricity Subsidy and 3 Kg LPG Directly to the Poor

[Hendra Kusuma – detikFinance](#)

Thursday, 8 Apr 2021 08:30 WIB

Driven by Coal Downstream as well as expensive LPG Imports



3 Kg LPG Subsidy Converted to Social Assistance, LPG Prices Can Rise

News – Anisatul Umah, CNBC Indonesia 9 April 2021 19:24

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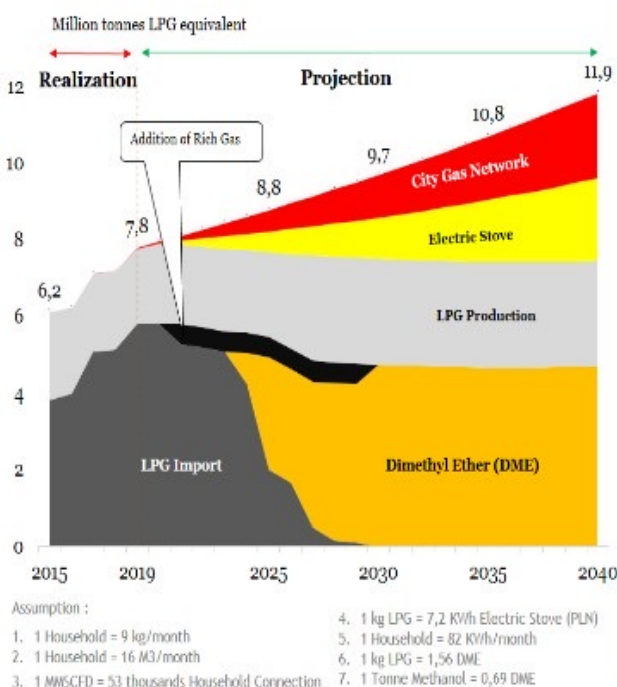


Downstreaming Is One of Coal Company's Strategies

Sunday 21 Mar 2021 11:29 WIB

Reporter: Intan Pratiwi / Red: Nidia Zuraya

LPG IMPORT REDUCTION ROADMAP



- Additional LPG production** of 500.000 for 2021-2029 from "rich gas" field.
- City gas network** : assumed addition of 500.000 household in 2021 and 750.000 annually starting from 2022. 15,5 millions of total household connected in 2040 with gas demand of 292 MMSCFD.
- Electric stove** : target of 1 million per year starting from 2021 equal to addition of 0,98 TWh/year electricity consumption. 20 millions household are targeted to use electric stove in 2040.
- Coal to DME downstream**

PKP2B	Year	DME equivalent production /year (million tonnes)
1 PT Kaltim Prima Coal	2024	1,2
2 PT Bukit Asam	2025	1,4
3 PT Arutmin Indonesia	2025	1,9
4 PT Adaro Indonesia	2027	1,4
5 PT Kideco Jaya Agung	2028	0,5
6 PT Berau Coal	2030	1,4
7 PT Bahari Cakrawala Sebuk	2033	1,4
8 PT Mandiri Inti Perkasa	2039	1,4
9 PT Inti Tirta Prima Sakti	2039	1,4
Total - DME equivalent		12,0

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Coal Gasification Technology will use Shell Gasifier (Air Products)

The World Largest CTL Project

Shanxi Lu'an 1,800 KTA Coal-to-Oil Complex Project

- 2018 Premium Engineering Prize of China Chemical Industry
- The largest Shell gasifier with daily coal consumption of 3,200 tons
- Gasification
- Purification
- Reforming
- Utility
- Pipeline project



China has converted coal into 13 million tons/year of DME as a substitute for LPG and also produces methanol from coal

Benchmark in Coal-to-chemicals Industry

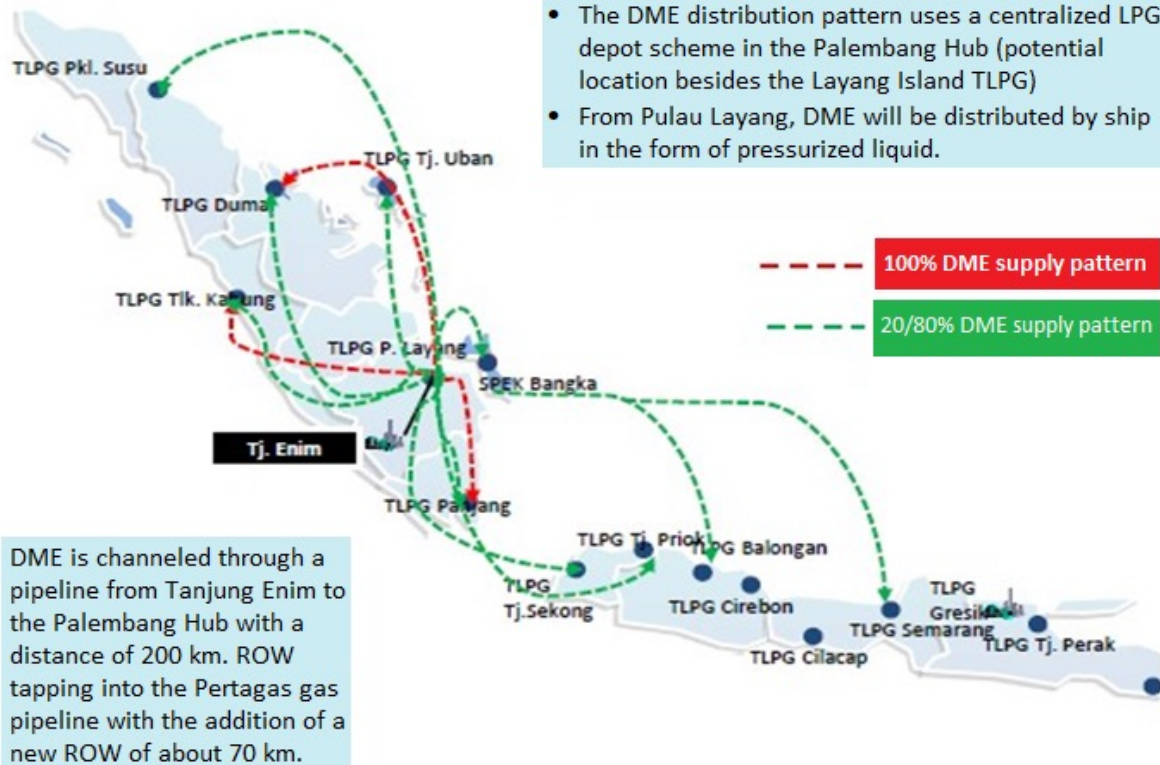


Nanjing Chengzhi Yongqing Energy Coal-to-Chemical Complex Project

- Leading exemplary projects for creating the circular economy
- Phase 4th: 600 KTA MTO and 100 KTA BDH (handover in April 2019)
- Phase 3rd: 1,000 tons/day Wison-Shell coal gasification plant, 295 KTA MTO, 250 KTA OXO, 35 KTA Coal-to-H₂
- Phase 2nd: 300 KTA CO, 100 KTA MeOH, 11kNm³/h Syngas, 21kNm³/h H₂
- Phase 1st: 300 KTA CO, 200 KTA MeOH

In addition to the construction of the Coal Gasification Plant into DME and Methanol, there will also be a change in the distribution pattern of LPG to DME

Mapping Pola Suplai 100% DME dan 20/80% DME/LPG



- The DME distribution pattern uses a centralized LPG depot scheme in the Palembang Hub (potential location besides the Layang Island TLPG)
- From Pulau Layang, DME will be distributed by ship in the form of pressurized liquid.

--- 100% DME supply pattern

--- 20/80% DME supply pattern

Key assumptions:

- Demand for DME as PSO (Assumption 1.31 x Demand for LPG PSO)
- Operating working days 26 days per month
- Assumed 1400 KTA capacity implementation in 2032

Topic 1

Question:

For practical purpose and ease of use by consumers, what do you recommend ie 80% LPG and 20% DME or 100% DME. What is the experience in China?

Answer:

100% DME或80% LPG混掺20% DME都可以作为民用燃料气使用，在中国，这两种情况以前都有应用。

We suggest to use 100% DME.

Topic 2

Question:

To convert LPG ships to DME ships, what needs to be done?

Answer:

在中国，运输船用途改变需要经过相关部门批准。从技术上讲，只需要将过流非金属密封件材料“橡胶”更换成耐DME腐蚀的介质。由于DME饱和压力较低，部分阀门、附件需要更换。

In China, to change the use of transportation vessel/ship, it shall require the approval of relevant departments. Technically speaking, in case LPG ships are changed to transport DME, the sealing material of the wetted non-metallic parts shall be replaced to endure the corrosion of DME. Besides, due to lower saturated pressure, some valves and accessories shall be replaced.

Topic 3

Question:

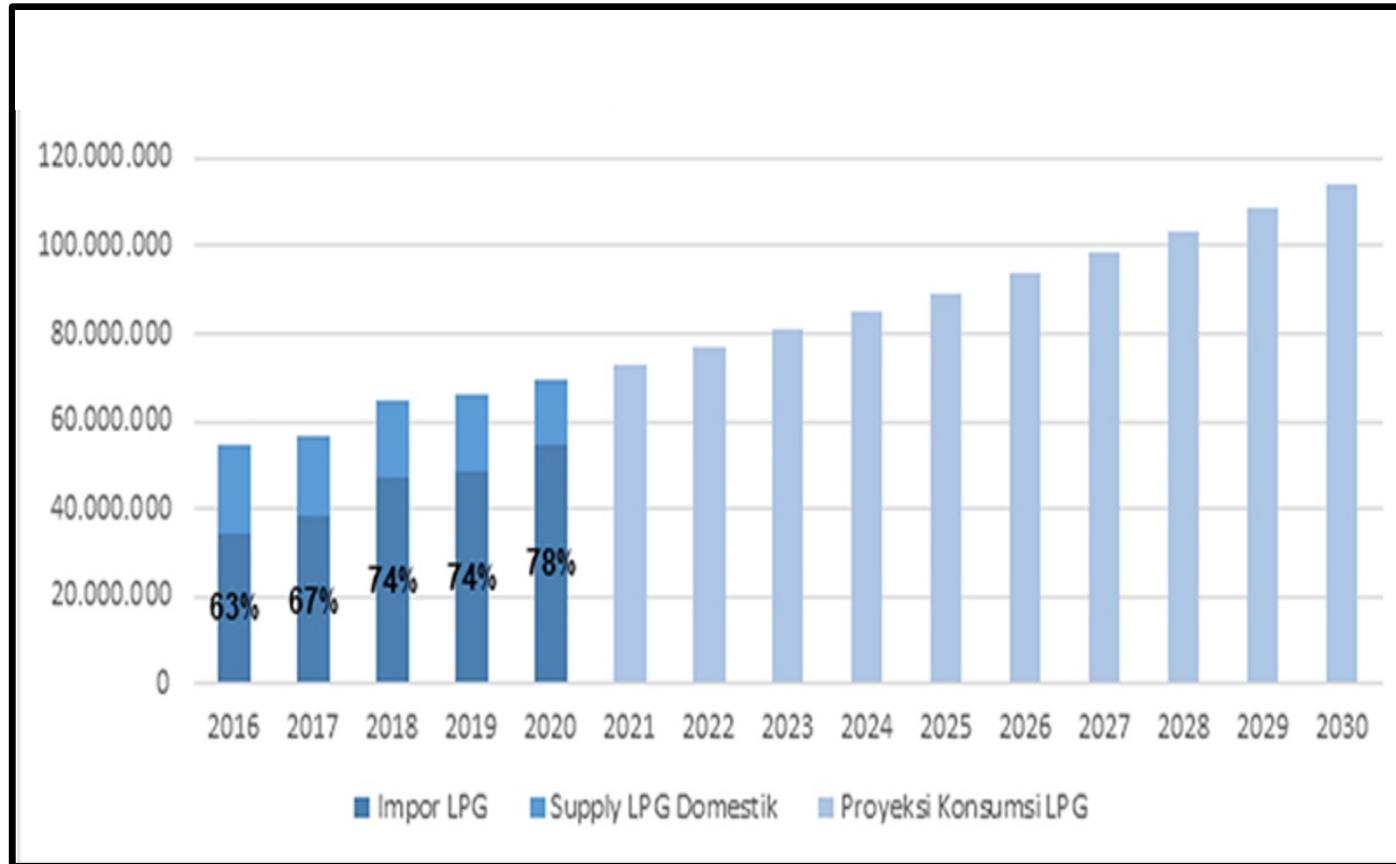
To convert LPG spherical storage tanks to DME storage tanks, what needs to be done?

Answer:

在中国，储存设备用途改变需要经过相关部门批准。从技术上讲，只需要将过流非金属密封件材料“橡胶”更换成耐DME腐蚀的介质。由于DME饱和压力较低，部分阀门、附件需要更换。

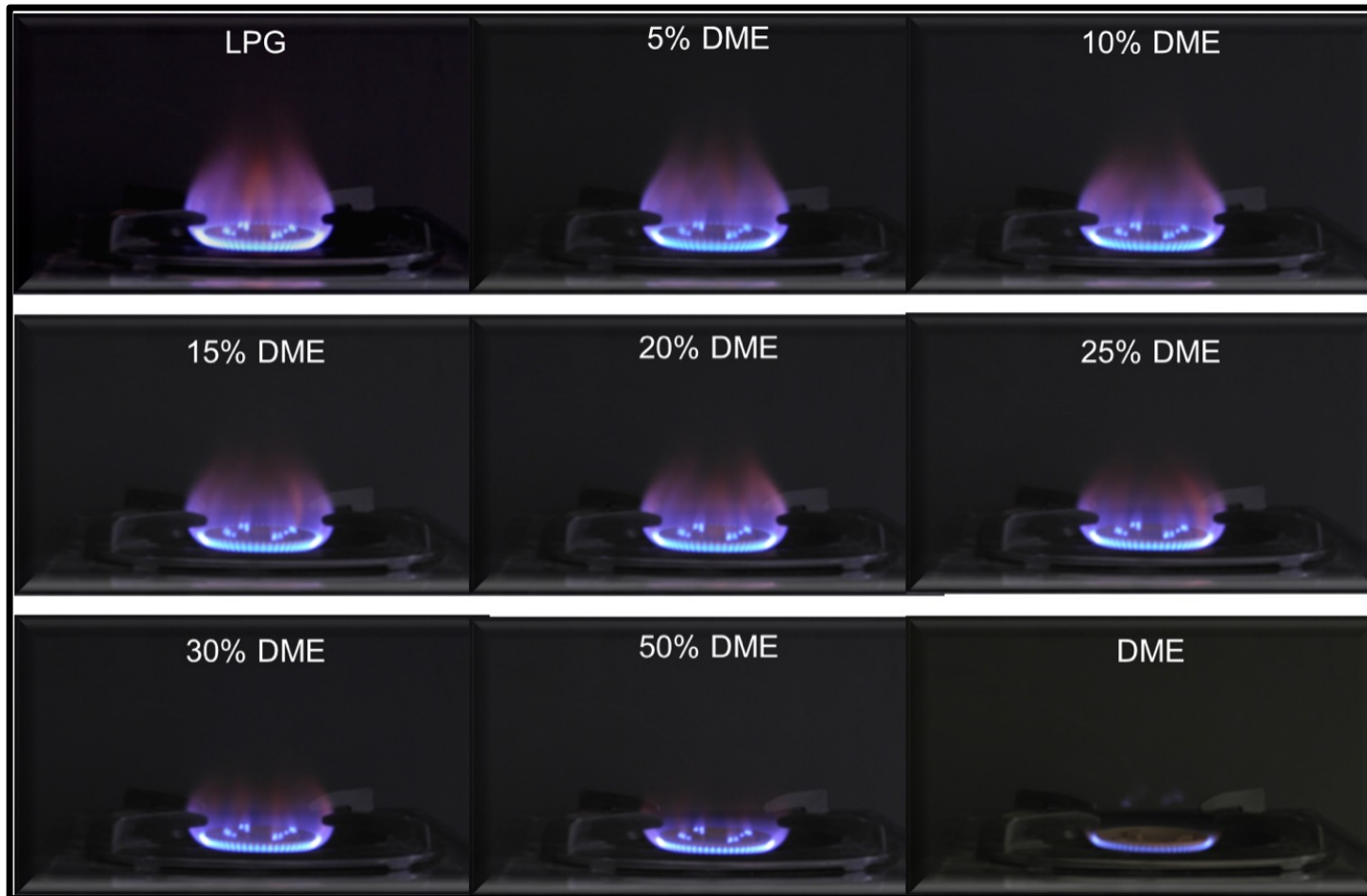
Similar as point 2.

Realized & Projected LPG Consumption



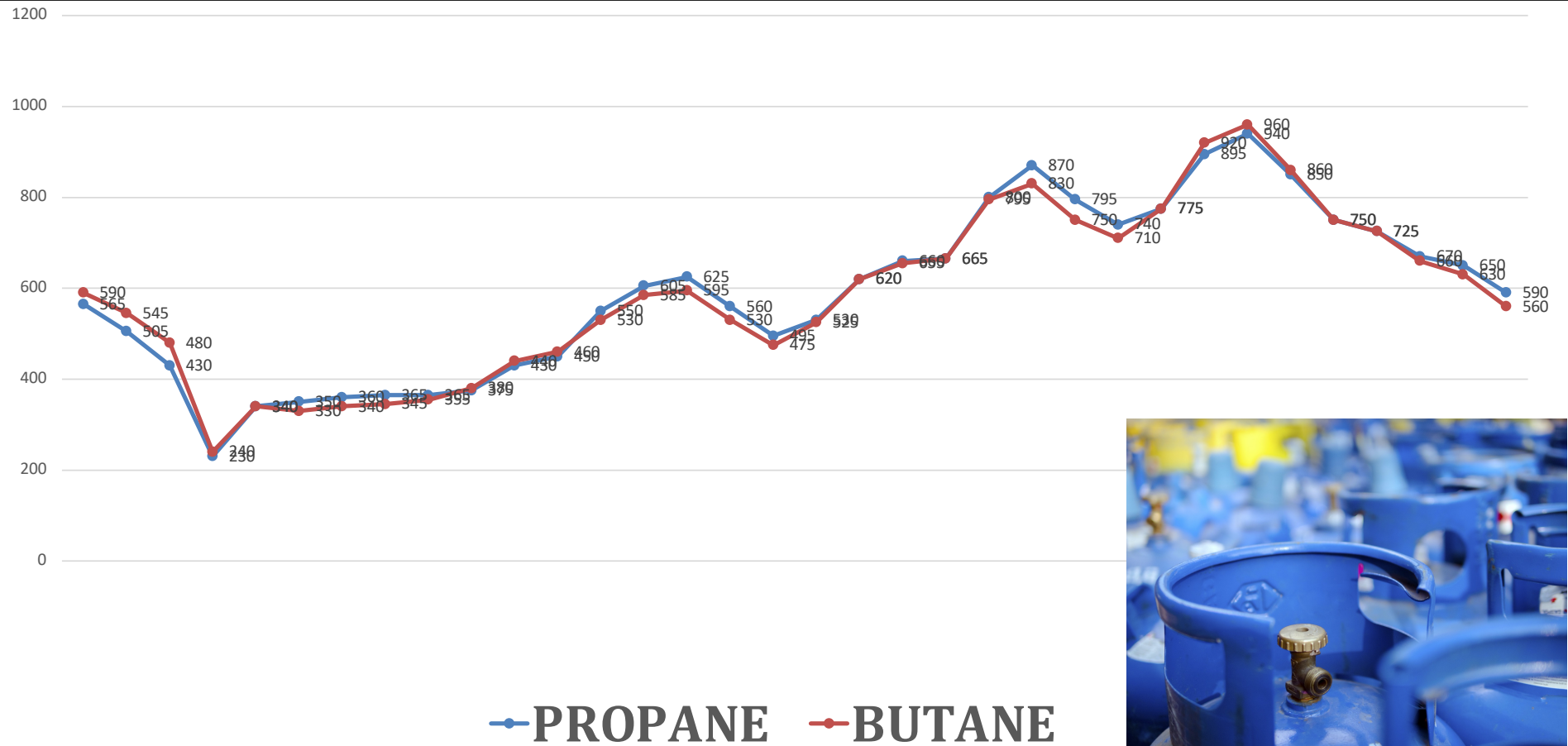
- Average consumption growth rate 5.07% pa.
- Consumption is mostly domestic (96%), commercial (2.5%) and industrial (1.5%).
- Based on Joint Research Center European Commission (JRCEC), DME production process from Coal yields emission at 153 kg CO₂/BOE while DME combustion yields emission at 412 kg CO₂/BOE, a little higher than burning LPG which yields emission at 386 kg CO₂/BOE.

Flame Progression DME-LPG Mixture



Source: "Dimethyl Ether (DME) sebagai substitusi LPG di Indonesia", Litbang ESDM, 22 July 2020

Aramco LPG Price (USD/MT): Jan 2020 – Oct 2022



Source: Internal compilation data from CP Aramco

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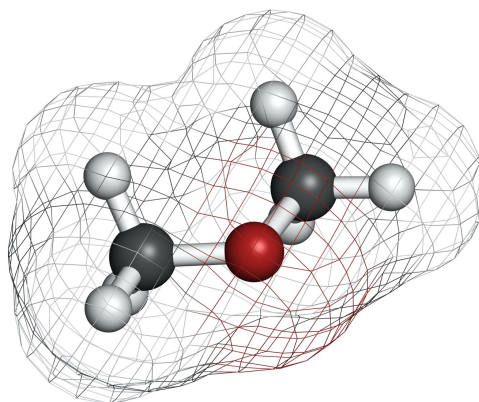
Cost Simulation of a Typical 300,000 MT/year of DME Production

Natural Gas Required as Feedstock	80	MMSCFD					
DME Production	300.000	tons/year					
			No. of People	Salary (USD/year)	USD/year	USD/ton	USD/MMBTU
CAPEX	EPC Cost ¹	320.000.000					
	Depreciation				19.200.000	64,00	2,33
OPEX	Human Resources	Plant Admin	10	40.000	400.000	1,33	0,05
		Labor/Operator	90	20.000	1.800.000	6,00	0,22
		Contractor	40	15.000	600.000	2,00	0,07
	Maintenance				10.666.667	35,56	1,29
	Utilities:						
	Power				21.600.000	72,00	2,62
	Water				400.000	1,33	0,05
				Subtotal OPEX	35.466.667	118,22	4,30
				Misc 8%	2.837.333		
				Overhead 10%	3.546.667		
				Total OPEX	41.850.667	139,50	5,07
LOGISTICS	Transportation ²					15,00	0,55
FEEDSTOCK	Natural Gas ³					165,00	6,00
OTHER COSTS	Import Duty & Taxes ⁴					12,38	0,45
				TOTAL COST		395,88	14,40
				PROFIT MARGIN	10,00%	39,59	
				FINAL PRICE		435,46	

Monthly Coal Price Index Worldwide: Jan 2020 - Sep 2022



Source: <https://www.statista.com/statistics/1303005/monthly-coal-price-index-worldwide/>



THANK YOU

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