



Narrative Policy Analysis: Utilization of Dimethyl Ether as an LPG Mixed Fuel (Case Study in Indonesia)

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Article Info

Article history:

Received 6 December 2023

Received in revised form 27

December 2023

Accepted 7 January 2024

Keywords:

Dimethyl Ether

Coal

Narrative Policy Analysis

Greenhouse Gas Emission

Abstract

Dimethyl Ether (DME) utilization as an LPG fuel mix policy has become a polemic among several groups. The purpose of this research is to analyze the effectiveness of narrative constructed by Government, analyze the counter narrative, and formulate a strategy to strengthen the Government narrative regarding the use of DME as an LPG mixed fuel. This research uses the Narrative Policy Analysis (NPA) method. The counter narrative is compared with Government narrative to obtain a meta narrative. The level of analysis in this research is meso. The conclusions from this research are: 1) Indonesia Government continues to use DME as a mixed fuel for LPG; 2) The obstacles of policy narrative constructed by the Indonesia Government are differences viewpoints regarding the availability and use of coal as raw material for DME and differences in belief system regarding greenhouse gas emissions. The recommended strategy to strengthen the Government's policy narrative are: 1) Comprehensive discussion by involving groups that oppose the narrative, 2) present the result of the feasibility study on greenhouse gas emission resulting from DME production process from coal which has been carried out by the Government by providing socialization regarding tax policy carbon as well as technical implementation of carbon economic value and controlling greenhouse gas emission.

Introduction

Natural gas is the third most widely used primary energy source in Indonesia, after coal and petroleum. Natural gas has an important role in the household, transportation, industrial and electricity sectors. One form of natural gas conversion that is most widely used by people in Indonesia is Liquefied Petroleum Gas (LPG). LPG consumption in Indonesia has increased every year since the government launched the kerosene to LPG conversion program in 2008. LPG consumption in the period 2016 - 2022 experienced an average growth of 4.36% per year. LPG volume consumption growth influenced by two factors, which are the expansion of kerosene conversion areas to LPG and the natural growth of public consumption needs (Center for State Revenue and Expenditure Budget Policy, 2020). However, the increase in LPG consumption is not balanced by an increase in domestic LPG production, so that the majority of domestic LPG fulfilled is done through imports.

LPG demand in 2016 was 6.64 million Tons, with 2.22 million Tons fulfilled from domestic refineries and 4.48 million Tons fulfilled from imports (66.80%). Meanwhile, LPG demand in 2022 has reached 8.56 million Tons, with 1.98 million Tons fulfilled from domestic refineries and 6.74 million Tons fulfilled from imported LPG. This data shows the growth trend of LPG demand and LPG import. High imports of LPG will affect the resilience and independence of LPG in Indonesia, higher imports will threaten the resilience and independence of LPG. Apart from that, high LPG imports will affect the trade balance, in this case the oil and gas trade balance. Table 1 shows the Indonesia LPG supply demand from 2016 to 2022.

Table 1. LPG Supply Demand (in Million Ton)

	2016	2017	2018	2019	2020	2021	2022
LPG supply							
• Domestic supply	2.22	2	2	1.93	1.92	1.90	1.98
• Import	4.48	5.46	5.57	5.71	6.40	6.34	6.74
LPG demand	6.64	7.20	7.56	7.78	8.02	8	8.56
% LPG import	66.80	73.12	73.56	74.68	76.90	76.94	77.29

Source: Directorate General of Oil and Gas, 2022

Indonesia's trade balance divided into the oil and gas import export trade balance and the non-oil and natural gas import export trade balance. Mesagan et al. (2022), stated that the surge in oil and gas imports would cause a trade balance deficit, so that foreign exchange reserves would be depleted and weaken the rupiah exchange rate. The oil and gas trade balance in the last five years has been negative, which is due to higher oil and natural gas imports compared to exports. Table 2 shows the oil and gas trade balance from 2017 to 2021.

Table 2. Indonesia Oil and Gas Trade Balance (in Million USD)

Description	2017	2018	2019	2020	2021
Export	13,260	14,987	9,507	6,011	9,806
Crude oil	5,410	5,102	1,705	1,427	2,956
Downstream condensate	3.73	-	14.78	-	-
Gas pipe	2,421	3,054	2,596	1,752	2,884
Upstream and downstream LNG	4,663	5,980	5,131	2,738	3,888
Refinery product (fuel and residue)	759	782	59	94	77
BBM export to Timor Leste	3.09	2	1.17	0.53	0.81
LPG export to Timor Leste	0.27	0.30	0.31	0.21	0.30
Refinery product (petrochemical)	0	67.70	-	-	-
Import	(21,040)	(26,169)	(19,437)	(12,083)	(22,929)
Crude Oil	(7,583)	(8,159)	(5,012)	(2,891)	(6,439)
Condensate	-	(874.68)	(852.63)	(545.30)	(1,067)
Refinery product	(10,822)	(14,138)	(10,983)	(5,821)	(11,210)
LPG	(2,635)	(2,996)	(2,590)	(2,826)	(4,213)
Oil and Gas Trade Balance	(7,780)	(11,182)	(9,930)	(6,074)	(13,123)

Source: Directorate General of Oil and Gas, 2022

In order to overcome high LPG imports, the Indonesia President issued Presidential Regulation Number 22 of 2017 concerning the General National Energy Plan (RUEN), which contains several programs carried out by the Government to control LPG imports to below 50%, one of which is by utilizing DME as an LPG mixed fuel. However, not all groups support the use of

DME as a mixed fuel for LPG. This rejection came from organizations and institutions that pay attention to energy policy and environmentalists. At least, there are two factors that cause the rejection of the use of DME as an LPG mixed fuel. First, DME is produced from coal, this is not in line with the primary energy mix target in the national energy policy as regulated in Government Regulation Number 79 of 2014, where the direction of Indonesia's energy use in the future is to reduce the use of energy originating from petroleum and coal as well as increasing the use of new, renewable energy and conservation energy, and natural gas. Second, related to the potential for increasing greenhouse gas emissions produced in the DME production process.

Observing the conditions above, apart from the narrative of the use of DME as a mixed LPG fuel created by the Government, a counter-narrative has also developed from several groups who do not support the use of DME as an LPG mixed fuel. Based on this, the author uses the Narrative Policy Analysis (NPA) method. The developing counter-policy narrative is compared with the Government's narrative as a policy maker to obtain a meta narrative to stabilize the developing narrative. Meanwhile, the aim of this research is to analyze the effectiveness of the narrative constructed by the Government, analyze counter-narratives, and formulate strategies to strengthen the Government's narrative regarding the use of DME as an LPG mixed fuel.

Previous Study

Several researchers have conducted studies regarding the use of DME as fuel. Zhang et al (2020), Heryadi et al. (2023), Kusnandar et al. (2020), and Anggraini et al. (2013) said that DME can be used as a fuel or as a mixed LPG fuel. Masudi et al. (2020) said that DME has characteristics similar to LPG and is an environmentally friendly fuel. Meanwhile, Lim et al. (2021) said that DME can be used to substitute LPG for the household and transportation sectors by making small infrastructure modifications. In Indonesia, several researchers have conducted research on DME, including Munaziza et al. (2020) and Putrasari & Lim (2021). Hennig & Haase (2021) Conducted research on the economics of using DME as an LPG mixed fuel. The conclusion in the research is that the minimum mixture of DME in LPG is 40% which can save the subsidy budget. Apart from that, Kivevele et al. (2020), said that changes in the market index price of LPG greatly affect the value of savings that the Government can receive. Another research was conducted by Lim et al. (2021) who conducted research on the use of DME from coal to reduce LPG imports. The research results state that apart from reducing LPG imports and increasing energy security, substituting LPG with DME can save the state budget of US\$ 388 million.

Methods

Narrative is a story concept that can provide an overview of the process of events in a phenomenon (Abbott, 2020). Narrative can be a collaboration between communication and knowledge. According to Boyd et al. (2020), narrative is an important concept to understanding a text and context. Narratives have the power to form beliefs that develop with the support of communication and psychology. This research was conducted using the NPA approach to analyze and identify policies made by the Government. Muhhina (2020) said that NPA is used to describe and analyze policy problems by construct a narrative.

According to Jones et al (2023), There are two important things in analyzing a policy narrative, which are policy elements and policy narrative content. There are four elements of policy narratives that develop in society, 1) setting or context of the problem, 2) characters/actors, consisting of protagonists/heroes, antagonists/villains, and victims, 3) plot, the actions taken by connecting each character/actor, and 4) moral of the story, moral message as a policy

solution that can be offered. Meanwhile, the content of the policy narrative contains the value system which is believed to be the goal (belief system), and the strategy of the narrator, in this case the Government as a policy maker, to manipulate or control the policy process.

Divided NPA into three levels of analysis, micro, meso and macro levels. At the micro level, research focuses on the question of how an individual or group of individuals construct narratives. At the meso level, research focuses on how policy actors can build and communicate narratives to groups who influence policy. At the macro level, research elaborates research questions in an effort to answer research questions regarding the impact of policy change and stability on culture and the country. In this research, the level of analysis used is meso, which is related to analyzing how the Government as a policy actor can construct a narrative against several groups who counter the narrative. Based on the data source, the research refers to the developing narrative originating from Ministry data, media reports, and interview transcripts that are relevant to the research problem.

Results and Discussion

Counter Narrative of Using DME As an LPG Mixed Fuel

There are two counter narratives related to the policy of using DME as an LPG mixed fuel. The first narrative is related to the use of coal as raw material for making DME, which is not in line with the primary energy mix target in the national energy policy regulated in Government Regulation Number 79 of 2014. The direction of energy use in national energy policy in the future is to reduce the use of energy originating from petroleum and coal, and increase the use of new, renewable energy and conservation energy and natural gas. According to Xu et al (2021), Coal mining activities have a negative impact on the environment, including landscape changes, decreased soil fertility levels, threats to biodiversity, decreased water quality, decreased air quality, and environmental pollution due to waste produced in the mining process.

Table 3. Primary Energy Mix Target for 2025 dan 2050

Energy Source	2025	2050
Crude oil	<25%	<30%
Coal	Min. 30%	Min. 25%
New, renewable energy and conservation energy	Min. 23%	Min. 31%
Natural gas	Min. 22%	Min. 24%

Source: Government Regulation Number 79 of 2014

The second narrative is related to the use of coal as a DME raw material which can increase greenhouse gas emissions. Based on Government Regulation Number 98 of 2021, greenhouse gas emission in the atmosphere are contained both natural and anthropogenic. Carbon dioxide (CO₂), sulfur dioxide (SO₂), nitrogen monoxide (NO), nitrous oxide (N₂O), methane gas (CH₄), and chlorofluorocarbons (CFC) are the main contents of greenhouse gas. Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) gases are the main contributors to greenhouse gas. Carbon dioxide (CO₂) contributes 64%, methane (CH₄) contributes 18%, and nitrous oxide (N₂O) contributes 6% to the increase in global warming (World Meteorological Organization, 2011). Carbon gas as the main contributor to greenhouse gases is produced from burning fossil fuel sources, such as oil and coal.

Based on a study conducted by Action for Ecology & People's Emancipation (AEER), DME production with a capacity of 1.4 million Tons per year sourced from 6 million Tons of coal can produce greenhouse gas emissions of 4.26 million Tons of CO₂-eq per year which comes

from the coal extraction process and DME production. For comparison, with the same capacity of 1.4 million Tons per year, greenhouse gas emissions resulting from LPG production are 824 thousand Tons of CO₂-eq per year. AEER calculates CO₂ emissions resulting from each stage of the DME manufacturing process which can be seen in table 4.

Table 4. Greenhouse Gas Emmission from DME Production

Process	Emmision Source	Volume		Ton CO ₂ -eq/year
Syngas synthesis	Electricity	1,4 x 10 ⁶	MWh/year	1,2 x 10 ⁶
	Hot steam	0,33 x 10 ⁶	Tons/year	0,11 x 10 ⁶
	CO ₂	0,77 x 10 ⁶	Tons/year	0,77 x 10 ⁶
Sub Total Emmission in Syngas synthesis				2,08 x 10 ⁶
DME synthesis	Electricity	1,34 x 10 ⁶	MWh/year	0,33 x 10 ⁶
	Hot steam	1,99 x 10 ⁶	Tons/year	0,65 x 10 ⁶
	CO ₂	0,62 x 10 ⁶	Tons/year	0,62 x 10 ⁶
Sub Total Emmission in DME synthesis				1,6 x 10 ⁶
Emmision from coal mining (6 million Tons per year)	Fugitive emmission			196 x 10 ³
	Fuel burning			132 x 10 ³
	Blasting			5 x 10 ³
	Electricity			105 x 10 ³
	Coal handling			49 x 10 ³
	Coal transportation			98 x 10 ³
Sub Total Emmission from coal mining				585 x 10 ³
Total emmission				4,26 x 10⁶

Source: Action for Ecology & People's Emancipation (AEER), 2020

Narrative of The Use of DME As an LPG Mixed Fuel

The Indonesian government has ratified the Paris Agreement on the United Nations Framework Convention on Climate Change in accordance with Law Number 16 of 2016. With the ratification of the Paris Agreement, the Indonesian Government has an obligation to contribute and commitment to reducing nationally determined greenhouse gas emissions (Nationally Determined Contributions/NDC) to limit the increase in average global temperatures below 2 °C to 1.5 °C. The Indonesian government is targeting a 29% reduction in greenhouse gas emissions by 2030 with its own efforts, or 41% with the support of international cooperation without any action (business as usual).

According to the previous explanation, one of the contributors to greenhouse gas emissions is carbon gas produced from burning coal. Based on the Roadmap for Coal Development and Utilization, 85% of domestic coal is used in the electricity sector as raw material for electric steam power plant. In order to reduce coal use in electric steam power plant, the President issued Presidential Regulation Number 11 of 2022, which among other things regulates the acceleration of the development of renewable energy for the supply of electricity and a roadmap for accelerating the end of the operational period of electric steam power plant, so that it is

hoped that the primary energy mix and greenhouse gas emission targets as stipulated in the national energy policy can be achieved.

In order to control greenhouse gas emissions resulting from power plants and the oil and gas industry, the Government has established a carbon tax as regulated in Law Number 7 of 2021. In addition, the President has issued Presidential Regulation no. 98 of 2021 which regulates the technical implementation of carbon economic value and controlling greenhouse gas emissions. Based on the “Indonesian Energy Outlook 2021”, the Government has prepared a Roadmap for the Energy Sector Carbon Market, where the CO₂ emission threshold in 2021 - 2024 will use a weighted average per cluster, then after 2024 the CO₂ emission threshold will use an ideal benchmark per cluster. In 2022 – 2024, the carbon market sector will enter the oil and gas sector with the use of Carbon Capture Storage (CCS) and Carbon Capture Utilization Storage (CCUS) technology. Industries that produce CO₂ exceeding the CO₂ emission threshold will be subject to tax in accordance with Law Number 7 of 2021. With the carbon tax regulation, it is hoped that it can increase awareness and change industrial behavior so that it can pay attention to its waste emissions in the context of reducing greenhouse gas emissions. Coal gasification project becomes DME PT. Bukit Asam Tbk in Tanjung Enim, South Sumatera, is one of 16 oil and gas sector projects planned to use CCS/CCUS technology.

Narrative Policy Analysis

Indonesia's energy policy in the future is guided by the paradigm that energy resources should not only be used as export commodities, but also as capital for nation development to realize energy resilience and independence (Ministry of Energy and Mineral Resources strategic plan, 2020). According to Government Regulation Number 79 of 2014, energy independence is a condition of ensuring the availability of energy in a country by making maximum use of the potential of its energy sources. Meanwhile, energy security is a condition where a country's energy availability is guaranteed and the public has access to energy at an affordable price while still paying attention to environmental aspects.

The discourse on using DME as an LPG mixed fuel began in 2013. The government has issued Minister of Energy and Mineral Resources Regulation Number 29 of 2013 which regulates the supply, utilization and trading system of DME as fuel. In 2017, the Research and Development Agency of the Ministry of Energy and Mineral Resources conducted an applied test of the use of 20%, 50% and 100% DME on 100 families in Marunda District, Jakarta. Furthermore, in December 2019 – January 2020, an application test of the use of 100% DME was also carried out on 155 families in the Palembang and Muara Enim City areas. The results of applied tests show that DME can be used as pure fuel or a mixture of LPG and is acceptable to the public. This can be seen in the ease of lighting the stove, normal flame stability, ease in controlling the flame, blue flame color, even though the cooking time required is 1.1 to 1.2 times longer than using LPG.

DME can be produced from various raw materials, such as natural gas, coal and biomass, either by direct or indirect DME synthesis. Currently, the development of DME in Indonesia is carried out using coal as raw material, through coal downstreaming with a coal gasification process. Coal gasification into DME has been designated as a National Strategic Project (PSN) in accordance with Presidential Regulation Number 109 of 2020 and included in the Priority Program in the National Medium Term Development Plan (RPJMN) for 2020-2024 as stated in Presidential Regulation Number 18 of 2020. Coal was chosen as the raw material for making DME because of its abundant availability in Indonesia. Based on data from the Geological Agency of the Ministry of Energy and Mineral Resources, Indonesia's coal reserves in 2020 were 38.805 billion metric Tons or around 3.6% of the world's total coal reserves. The coal

used as raw material for making DME is coal that has a low calorific value (< 5,100 cal/g), which has not been utilized optimally, because its selling value is low. As a pilot project, DME will be produced through PT. Bukit Asam Tbk in Tanjung Enim, South Sumatera, with a DME production capacity of 1.4 million Tons per year.

Head of the Research and Development Agency of the Ministry of Energy and Mineral Resources, Dadan Kusdiana, in a press release on December 7th 2020, said that downstreaming coal into DME as a substitute for LPG is expected to improve the oil and gas trade balance and increase national energy security. Furthermore, Dadan Kusdiana, said that there were six positive impacts from coal downstreaming. First, the use of DME will increase national energy security because it will reduce LPG imports by up to 1 million Tons of LPG per year. Second, the use of DME will save foreign exchange reserves of up to IDR 9.7 trillion per year and save trade balances of up to IDR 5.5 trillion per year. Third, the entry of investment from foreigners who will be involved in the DME processing sector amounts to USD 2.1 billion or around IDR 30 trillion. Fourth, the use of low-calorie coal as raw material for making DME is 180 million Tons and/or for 30 years of factory life. Fifth, the emergence of a multiplier effect in the form of direct benefits obtained by the Government of up to IDR 800 billion per year. Sixth, labor absorption involved 10,560 people in the construction phase and 7,976 people in the operations phase. Through this narrative, the Government wants to emphasize the need to diversify LPG into other energy sources, through the use of DME.

Table 5. Meta Narrative of The Use DME As an LPG Mixed Fuel

Analysis Level	Meso: The Indonesian government, as a policy maker for the use of DME as a mixed fuel for LPG, is faced with a number of groups who oppose this policy
Setting	<ul style="list-style-type: none"> • The increase in LPG consumption is not balanced by domestic LPG production, so the majority is fulfilled from import • High imports affect energy security and independence as well as the oil and gas trade balance • There is a need to diversify LPG into other energy sources through the use of DME
Actor	<ul style="list-style-type: none"> • Protagonist: Presiden, Government (Ministry of Finance, Ministry of Energy and Mineral Resources, Ministry of State-Owned Enterprise) • Antagonist: Groups who oppose the use of DME as an LPG mixed fuel (Action for Ecology & People's Emancipation, Lembaga Bersihkan Indonesia, Institute for Essential Services Reform, and Adidaya Initiative) • Korban/Victim: The government and public will be affected if there is a geopolitical conflict that results in shortage and high prices of LPG
Plot	<ul style="list-style-type: none"> • High LPG import to fulfilled domestic LPG demand • One strategy to reduce LPG imports is to develop DME as a fuel in accordance with Presidential Regulation 22 of 2017 • Coal gasification into DME has become a Priority Program in the RPJMN in accordance with Presidential Regulation Number 18 of 2020 and designated as a national strategic program through Presidential Regulation Number 109 of 2020 • There is resistance from several groups regarding the use of DME as a mixed fuel for LPG due to the use of coal as a raw material and the potential for increased greenhouse gas emissions

Moral Message	The government continues to use DME as an LPG mixed fuel to increase the resilience and independence of LPG and improve the trade balance in the oil and gas sector
Belief System	<ul style="list-style-type: none"> • The use of coal as a raw material for making DME is not in line with the primary energy mix target in the national energy policy • DME production from coal can increase greenhouse gas emissions • The President has issued Presidential Regulation Number 112 of 2022 which regulates the acceleration of the development of renewable energy to provide electricity to reduce the use of coal in steam power plants • DME production from coal will use CCS/CCUS technology which can reduce the resulting greenhouse gas emission
Strategy	<ul style="list-style-type: none"> • Conduct comprehensive discussions with groups who oppose the use of DME as an LPG mixed fuel, by presenting feasibility study data for DME development, and greenhouse gas emission test data resulting from the DME manufacturing process as a form of Government transparency • Conduct socialization regarding the direction of upstream and downstream coal development and a roadmap for coal development and utilization • Providing socialization of laws and regulations that have been issued by the Government relating to efforts to reduce greenhouse gas emissions

Meta Narrative Analysis

Meta narrative analysis was carried out to map the main narrative construct by the Government regarding the use of DME as an LPG mixed fuel with the counter narrative construct by groups who oppose the use of DME as an LPG mixed fuel. Meta narrative analysis was also carried out to determine the causes of differences between the two narratives that developed in society. Oschatz & Marker (2020) Said that the results of the meta narrative analysis were used to find solutions to differences in narratives so that we could find out what were the obstacles to the Government's policy narrative regarding the use of DME as an LPG mixed fuel. These solutions are then made into strategic steps that can be used as recommendations to control the policy process so that the Government's goals can be achieved.

Table 6. Meta Narrative Analysis

Counter Narrative	Dominant Narrative	Cause of Difference
The use of coal as a raw material for making DME is not in line with the primary energy mix target in the national energy policy	The President has issued Presidential Regulation Number 112 of 2022 which regulates the acceleration of the development of renewable energy to provide electricity to reduce the use of coal in electric steam power plant, so that the primary energy mix target in the national energy policy can be achieved	Different points of view regarding the availability and use of coal as raw material for DME

DME production from coal can increase greenhouse gas emissions	DME production from coal will use CCS/CCUS technology which can reduce the resulting greenhouse gas emissions. Law Number 7 of 2021 which regulates carbon taxes, so it is hoped that it can increase awareness and change industrial behavior so that it can pay attention to its emissions	Different belief system
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Based on the meta narrative analysis above, a gap can be seen between the narrative construct by the Government regarding the policy of using DME as an LPG mixed fuel and the groups that are counter narrative about this policy. From the table 6, it can be seen that there are two obstacles to the policy narrative developed by the Government. First, there are different points of view regarding the availability and use of coal as raw material for DME. Second, related to the belief system, where the counter narrative predicts that the use of coal as a raw material for DME can increase greenhouse gas emissions. Meanwhile, the Government believes that greenhouse gas emission resulting from the DME manufacturing process can be reduced by using CCS/CCUS technology and implementing a carbon tax regulatory. Counter-narratives in the public policy space are a natural thing, as a response to concerns from groups regarding the impact of a policy made by the Government as well as from groups who are not involved in the policy process. Counter narratives also function as a check and balance between society and the Government. However, the Government as a policy maker needs to straighten out the counter-narrative that is developing in society so that it does not become a wild issue, so that the Government's goals can be achieved.

Conclusion

Based on the results and discussions related to the policy of utilizing DME as LPG mixed fuel, several conclusions were obtained: The main narrative developed by the Government is to continue the use of DME as an LPG mixed fuel to reduce LPG imports and increase energy security and independence in order to supply domestic LPG. The obstacles of the policy narrative developed by the Government are differences in viewpoints regarding the availability and use of coal as raw material for DME and differences in belief systems regarding greenhouse gas emissions resulting from the DME manufacturing process and greenhouse gas emissions that can be reduced by using CCS/CCUS technology. Several recommendations that can be made to strengthen the Government's narrative are as follows: Comprehensive discussion and involve groups who oppose the use of coal regarding the use of coal which is considered not in line with the primary energy mix targets in the national energy policy. In the discussion, the Government presented a feasibility study for DME development using a comparison of coal, biomass and natural gas raw materials, including data regarding reserves of each source of raw materials, process technology, economics, as well as the impact on the amount of import reduction. LPG. Apart from that, the Government needs to explain the direction of upstream and downstream development of coal as well as a roadmap for the development and utilization of coal in the future, including diversifying the use of coal with new and renewable energy sources. Comprehensive discussion and involve groups who oppose the use of coal as a raw material for DME, regarding the use of coal as a DME raw material which can increase greenhouse gas emission. Government has to be able to explain the data related to greenhouse gas emission that can be produced from the DME manufacturing process and how percentage of greenhouse gas emission can be reduced by using CCS/CCUS technology, so it hoped that

it can increase awareness and change industrial behavior so that it can pay attention to its emission.

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