Challenges and prospects of developing city gas to reduce imported LPG in Indonesia

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Abstract. Indonesia has natural gas potential that can be developed through the city gas program. Although the city gas program has been designed since 2009, its effectiveness in addressing the critical LPG issues is still insignificant. The achievement of the city gas development target in 2019 has only reached 12% of the government's target of 4.7 million SR (house connections) in 2025. We conducted content analysis and in-depth studies on several legal products and literature related to opportunities and challenges in the city gas development. We found that the main problem was the limited investment from both the government budget and the corporate budget. Challenges of city gas development are low project economics, delays in upstream natural gas projects and natural gas infrastructure development, and low customer satisfaction. Meanwhile, obstacles to city gas development are the length of the licensing process, social problems, unclear KPBU (Community - Business Entity Cooperation) scheme, and undefined handling of LPG subsidy (3 Kg). This finding is expected to be taken into consideration in the formulation of a more effective and massive city gas development strategy in the future.

1. Introduction
Indonesia's natural gas reserves as of January 2019 amounted to 77.29 trillion cubic feet (TSCF), [1] while the average production was 2.9 TSCF per year [2]. Natural gas has a vital role in Indonesia's energy mix policy, which is currently the third most used primary energy in Indonesia after oil and coal [3]. Natural gas is no longer considered an export commodity but as a national development capital, and the government is committed to advancing the domestic market. With this policy, the percentage of natural gas exports decreased from 52.5% in 2009 to 34.9% in 2019 [4].

One of the uses of refined natural gas in Indonesia is LPG (Liquefied Petroleum Gas), whose demand continues to increase in line with the success of the kerosene to gas conversion program that began in 2007. However, in reality, Indonesia can only produce LPG around 26% of the total community needs in 2018. Thus, Indonesia must import LPG by 74% or about 5.5 million tonnes [3], which will worsen in the following years.

Besides, Indonesia also has to bear the burden of LPG (3 Kg) subsidies for the household sector. Although LPG subsidies fell in 2015 and 2016, due to the decline in global commodity prices, LPG subsidies increased again in the following years. In 2018, the LPG subsidy reached Rp. 58.14 trillion, and the realization of fuel & LPG subsidies came 207% of the APBN (State Budget) in 2018 [5]. The government's high state budget funds to subsidize the LPG (3 Kg) is allegedly caused by the opening of its distribution so that the subsidy is not on target.
Unlike LPG, natural gas production in the form of dry gas in Indonesia is relatively abundant, which should be a solution to imports and LPG subsidies. However, the allocation for the export market is still high due to long-term contracts. Indonesia must be able to utilize the potential of natural gas to replace the role of LPG as a household fuel in the form of city gas. In reality, city gas network development has not been able to reduce national LPG consumption. The realization of PT Pertamina's LPG sales for the household and industrial sectors in 2019 was 7.76 million metric tons, an increase of 0.2 million metric tons from 2018 [1]. In 2020, LPG consumption is also expected to continue to increase. We carry out content analysis and research on several legal and policy products, journals, news, and other publications that discuss city gas in Indonesia. We map the prospects and challenges faced to be considered by the government and business entities to determine the next city gas development plan.

2. Methodology
The study used a descriptive qualitative approach. Descriptive research data is collected based on factors that support the object of research, and then these factors are analyzed to look for its role. [6]. Research methods include collecting data through the study of literature, reports, and journals, which will serve as the theoretical basis for further discussion [7]. Analysis activities consist of data collection, data condensation, data presentation, and concluding as a cyclical and interactive process. [8]. Researchers triangulate and check members to get consistent and valid results.

3. Regulations and status of city gas
City gas is a Strategic Priority Project (Major Project) in the RPJMN 2020-2024 [9]. The development of city gas in Indonesia began in 2009, and during this decade, 537 thousand house connections (SR) have been built [10]. City gas development is carried out through two scenarios, namely (a) operational assignments from the Government to BUMN (state-owned enterprises) with development financing sourced from the APBN, and (b) the initiative of the business entity itself. The development of city gas by the Ministry of Energy and Mineral Resources until the end of 2019 was 400,269 SR covering 17 provinces or 47 districts/ cities [1]. The remaining network was built by PT Perusahaan Gas Negara (PGN) and PT Pertamina Gas (Pertagas). There is no involvement of private enterprises in the development of city gas infrastructure in Indonesia.

![Figure 1. Cumulative household connection (SR) city gas (in thousand) [10].](image)

In the upstream sector, city gas is the main priority for natural gas users [11]. Even so, city gas is a natural gas consumer with the lowest absorption, namely 5.11 BBTUD or only 0.08% of all-natural gas production in 2019 [4]. There is no binding and permanent regulation regarding the number of upstream gas prices for city gas. However, the government has set 4.25 to 4.72 USD per MMBtu through a Ministerial Decree, which only applies specifically to specific locations and does not apply to the entire program [2].
4. City gas development

4.1. Planning
The government targets the development of gas networks for households of 4.7 million households by 2025 [12]. For 2020 to 2024, the government has prepared targets and funding scenarios as presented in Table 1 regarding city gas development through the APBN, which will end in 2021 and after that, the government will rely on the involvement of BUMN and private business entities with the Community - Business Entity Cooperation Scheme (KPBU).

| Indication of Target and Funding | 2020 (SR) | 2021 (SR) | 2022 (SR) | 2023 (SR) | 2024 (SR) | Total (SR) |
|--------------------------------|-----------|-----------|-----------|-----------|-----------|------------|
| City Gas Development through APBN | 266,070   | 100,000   | -         | -         | -         | 366,070    |
| City Gas Development KPBU Scheme | 50,000    | 839,555   | 800,000   | 800,000   | -         | 2,489,555  |
| City Gas Development by BUMN      | 50,000    | 583,930   | -         | -         | -         | 633,930    |

5. Opportunities

5.1. Major project
As one of the 2020-2024 National Priority Projects, the government will pay more attention to the development of city gas [9]. Not only the Ministry of Energy and Mineral Resources in charge of the energy sector, but it will also be of concern to related Ministries such as the Ministry of Finance and the Ministry of Home Affairs. The implementation of monitoring and evaluation is more intensive than other programs, so it is hoped that the government will provide solutions to problems that arise for investors.

5.2. Natural gas reserve
The ratio of reserves per natural gas production in Indonesia is 33.9 years [13]. Also, there is still more hope for natural gas due to an increase in Reserves Replacement Ratio (RRR) which reached 106% in 2018, and due to the discovery of new gas reserves, which are always found every year with an RRR of 106% [14] in 2018 and 353.72% in 2019 [4]. The RRR surge contributed significantly to increasing national oil and gas reserves.

5.3. Natural gas production
Indonesia's natural gas production currently exceeds national needs, although some domestic gas sales contracts cannot be fulfilled optimally. Natural gas for export has decreased since the natural gas paradigm to encourage national development began to be discussed. To ensure the reliability of national natural gas supply, there are several large upstream natural gas projects such as the Block A Aceh, the East Natuna, the Jambaran Tiung Biru, the Indonesia Deep Water (IDD), the Merakes, the Tangguh Train 3, the Asap-Kido-Merah, and the Lapangan Abadi (Masela) [2].

5.4. There are still many existing distribution network lines that have not been developed
Indonesia has a transmission and distribution network that extends and extends, especially in Java and Sumatra, It can be optimized by building city gas along with the transmission and distribution network. For example, the Cilegon - Cirebon transmission network, as shown in Figure 2, passes through several cities/ regencies with relatively high population densities and Gresik - Semarang network and transmission network that stretches from the Dumai to South Sumatra.
Figure 2, Transmission, distribution, and city gas networks in Banten, DKI Jakarta, and North West Java [15]

The government can implement one distributor and one natural gas trader in one area of the distribution network, City gas development can also be carried out in line with constructing a natural gas network for commercial use, such as small and medium customers, In cities/ regencies that have integrated natural gas pipeline networks between households and commercials, it will help the economy of city gas managers [16].

5.5. Natural gas network development plan
Based on the Regulation of the Minister of Energy and Mineral Resources Number 2700 K/11/MEM/2012 concerning the Master Plan for the National Natural Gas Transmission and Distribution Network 2012 - 2025, the government plans to build a transmission network on Cirebon – Semarang, KEK Sei Mangkei - Dumai and distribution network areas for 71 Districts/ Cities [17]. It certainly adds to the potential for a more massive city gas development, which, from the beginning, relies on the infrastructure of the natural gas distribution network.

Figure 3. National natural gas infrastructure development plan 2019-2028 [17].
5.6. KPBU scheme
Starting in 2022, the government will stop APBN allocation for city gas development and replace it with the KPBU scheme with BUMN and private companies [9]. In the KPBU scheme, the management of city gas infrastructure will be outlined in a cooperation contract that is expected to guarantee investment returns to attract investors. Besides, the government and business entities can formulate a long-term plan for its development and implementation.

5.7. Prices on household and social acceptance
To optimize it as a substitute product for LPG at an affordable price and increase city gas revenue for the community, the government imposes a tariff for households and small customers using LPG market price as a comparison. The average city gas price is set at IDR 4,227 per m3, which is lower than the market price for subsidized LPG (3 kg) of 5,555 per m3 [18]. Also, the procurement of city gas helps the community provide fuel to their homes so that people do not have to spend time buying and replacing LPG cylinders, Meanwhile, public interest in natural gas is relatively high, at 75.6%, and the rest is doubtful [16].

6. Challenges

6.1. Cost and Pricing
Upstream gas price for city gas is the lowest price among other natural gas consumers, even lower than the gas price for specific industries that have undergone adjustment [19]. Unlike gas prices for particular industries, cooperation contract contractors do not receive compensation from the difference in economical prices. Currently, the determination of the upstream gas price for city gas has not been considered burdensome for oil and gas contractors, It is due to the relatively small absorption volume of city gas when compared to other consumers, High investment costs, low tariffs for household consumers, and a low volume of distribution are the reasons for the unattractive economic of gas network development projects [16]. To help this, the government took the initiative to use APBN in infrastructure development, which subsequently assigned BUMN to operate,

6.2. Delays in upstream and downstream oil and gas projects
Although the government had a Master Plan for the National Natural Gas Transmission and Distribution Network (RIJTDGBN) for 2012-2025 [20], some of them did not go according to plan, for example, mini LNG (Liquefied Natural Gas) in East Java and construction of Gresik - Semarang transmission network were still experiencing problems. The main problem is the certainty of demand and source of supply. Infrastructure projects can only be executed when these two are ready. If one of them experiences a setback, then the infrastructure will only become unused and lead to project losses. Another factor of lagging from the downstream side is the licensing process and the problems that arise before and when the city gas development process runs [18]. As a national priority program, the central government, regional governments, and business entities should deal with these two problems.

6.3. City gas service
Assessment of natural gas distribution services for 2015 to 2018 respectively shows unsatisfactory results. The assessment indicators are based on expert opinion by considering the condition data of natural gas distribution parameters. These parameters are disrupting domestic natural gas supply, which consists of unplanned shutdowns of more than 30 days a year. Natural gas infrastructure is not yet available, but supply is available or vice versa, and delayed realization of upstream projects [13].

Reference [21] shows that the level of customer satisfaction of household natural gas networks is still low. The things that are expected by the Depok City gas customers to be immediately fixed are the speed of the officers serving meter account errors and the speed of the officers serving complaints according to the promised time. Besides, there are improvements in the reliability of the materials used in the household gas meter network, the condition of the rotation of gas meter numbers according to the number of usages, and the accuracy of records made by gas meter recording officers [21].
7. City gas development constraints

7.1. Government licensing and social acceptance
The development of the city gas requires permits and land use from the local government, which is not easy to do [22]. It also occurs in developing natural gas transmission networks such as the Gresik - Semarang segment [18]. There is a need for coordination between the central government and regional governments to accelerate the licensing process because, after all, city gas is a national strategic project, and the community will quickly feel its benefits. Even though public interest is relatively high in city gas, the regional government needs to socialize and educate about the benefits of installing city gas. No less important than the installation of city gas is guaranteed safe. A wrong approach to the community will only slow down the completion of city gas development.

7.2. KPBU scheme is not clear
Currently, the KPBU scheme for city gas development is still unclear. KPBU will be implemented starting in 2021 with 50,000 SR [9], but there has been no investment or legal products related to this scheme in the city gas project. The government admits that implementing the KPBU scheme for city gas development will require a long process and is currently still in the initial review stage. No public consultation has yet been carried out [23]. The delay in regulation and clarity of the KPBU scheme will undoubtedly affect the acceleration of city gas development because the city gas development budget for 2020 has decreased due to the Covid-19 pandemic [24] have an impact in the following year.

7.3. LPG subsidy policy is still unclear
The city gas program that has been started by Indonesia since 2009 is still ineffective, as seen from the volume of LPG imports, which continue to increase every year [5]. One of the goals of city gas development is to reduce the volume of LPG imports by utilizing domestic natural gas. The LPG subsidy is considered to be one of the main things that cause the ineffectiveness of the city gas program in Indonesia. It is because LPG (3 Kg) distribution is still open. Although there are already regulations regarding specific closed LPG distribution systems, implementing these policies is not optimal [25]. Due to LPG's free distribution (3 Kg), people are less interested in city gas development in their area, such as the people in Bojonegoro [26].

8. Conclusions
Apart from abundant reserves and natural gas production that is sufficient for domestic needs, the existing infrastructure and natural gas infrastructure development plans offer good prospects for developing city gas in the future. The main problem in the development of city gas is the lack of involvement of the private sector, based on the low level of the project economy. High investment costs, low distribution of natural gas, and low tariffs affect investor interest in participating. The government is still providing support in the form of city gas development through APBN funding. However, this will not last long, so the KPBU scheme, which is expected to guarantee the business entity's economy, must be implemented immediately. The challenges in developing city gas infrastructure are low level of the economy, delays in upstream natural gas projects and infrastructure development and, low customer satisfaction in using natural gas in their homes. The main obstacles are the lengthy licensing process, social problems, vague KPBU scheme, and unclear handling of LPG subsidy (3 Kg). It will affect the speed of development even though the government can handle it immediately.

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