

Economic Analysis of New Product (Gas for Absorption Chiller in Commercial Segment Customer)

by Yulita Susanti

Submission date: 13-Apr-2023 03:51PM (UTC+0700)

Submission ID: 2063328958

File name: 75-Article_Text-215-1-10-20190905.pdf (153.39K)

Word count: 6230

Character count: 28936

Economic Analysis of New Product (Gas for Absorption Chiller in Commercial Segment Customer)

Wisnu Haryadi¹, Yulita Fairina Susanti^{2*}

¹²Sekolah Tinggi Manajemen Ipmi, DKI Jakarta 12750, Indonesia

ABSTRACT

The purpose of this is to evaluates a new product called GasCool that will be implemented by the company before this product launch to the costumer. This new product is a solution for the PT Perusahaan Gas Negara, Tbk ("PGN") to manage their declining revenue in commercial customer segment in the last 4 years. This study used an economic analysis to ev³⁵ates GasCool using three parameters. The parameters consist of Net Present Value, Internal Rate of Return and Payback Period. The result indicates that GasCool is feasible to be implemented and sell to the commercial segment customer. The economic analysis has shown that selling Gas Coll will generate 17.6% Internal Rate of Return and 5.5 years Payback Period. Furthermore, the Net Present Value from selling GasCool is Rp10,4 billion in 10 years of implementation and the discount rate for economic analysis is 8.2%.

© 2018 IJBS, All rights reserved.

ARTICLE INFO

Keywords:

Gas Cool,
Commercial Segment Customer,
Economic Analysis,
Financial Projection.

2
*Corresponding Author E-mail:
yulita.susanti@ipmi.ac.id



Copyright © 2018 Authors. This is an open access article distributed under the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

11 Industry Background

Natural gas plays a very imp²⁴nt role in the energy mix policy in Indonesia. Natural gas is the third most used primary energy in the country after petroleum and coal. The g¹¹overnment aggressively continues to encourage domestic natural gas utilization, including through the development of natural gas infrastructure (pipelines and LPG / CNG / LNG) to stimulate domestic industries and maintain a cleaner environment.

The use of natural gas in Indonesia only began in the early 1960s. Starting with the distribution of natural gas through a pipeline from PT Stanvac Indonesia's natural gas field in Pendopo, South Sumatra to the Pupuk Sriwidjaja factory, Pusri-1A in Palembang. In 1974 Pertamina began supplying natural gas from the field in Prabumulih, South Sumatra to PusriII, PusriIII and Pusri IV.

In 1974, Pertamina also began supplying natural gas from the field in the Cirebon area and from the offshore Java Sea for fertilizer, cement, ceramics and steel plants, as well as several power plants in West Java and Cilegon, Banten. In 1977, Indonesia began exporting natural gas (LNG) from the Bontang refinery and was followed in 1978 from the Arak refinery so that for several years Indonesia had become the largest LNG exporter in the world.

Currently, Indonesia is still an exporter of natural gas in the form of LNG and gas pipeline, but the supply of natural gas for export continues to decline along with the increasing domestic demand from year to year. Domestic natural gas utilization increased by an average of 9% from 2003 to 2016. Since 2013 the volume of natural gas to meet domestic demand is greater than exports. In 2016, it is estimated that 41% of natural gas is exported from national natural gas production and next year domestic natural gas supply increases to 62%. The government is committed not to extend the LNG sales contract for export which has expired.

34 Company Background

PT Perusahaan Gas Negara (Persero) Tbk ("PGN") initially named F.L.J.N. Eindhoven & Co. Gravenhage was established in 1859. Then, the Company was named NV. Netherland Indische Gaz Maatschapij (NV. NIGM), when the Dutch government took control in 1950. In 1958, when the Government of the Republic of Indonesia took over the entity, the company name was changed to Badan Pengambil Alih Perusahaan-Perusahaan Listrik dan Gas (BP3LG) and then later became BPUPLN in 1961. On May 13, 1965, based on Government Regulation No. 19/1965, the entity was established as a state-owned company ("Perusahaan Negara") and became known as PN Gas. Based on Government Regulation No. 27 the year 1984, PGN was converted into a public service enterprise ("Perum") under the name PGN.

Afterward, the status of the Company was changed from a Perum to a state-owned limited liability company ("Persero") and the name was changed to PT Perusahaan Gas Negara (Persero) based on Government Regulation No. 37 the year 1994 and

the Deed of Establishment No. 486 dated May 30, 1996, as notarized by Adam Kartamaji, S.H. The deed of establishment was approved by the Ministry of Justice of the Republic of Indonesia in its Decision Letter No. C2-7729HT.01.01. Th.96. dated May 31, 1996, and was published in The State Gazette of the Republic of Indonesia No. 2508 dated October 4, 1996, Supplement No. 80. The latest amendment of the Company's Articles of Association was based on Notarial Deed No. 23 and 24 of Notary Fathiah Helmi, S.H., dated April 6, 2015, concerning the changes of the Company's Articles of Association and the composition of the Boards of Commissioners of the Company. The amendments were reported to and accepted by the Ministry of Laws and Human Rights of the Republic of Indonesia in its acknowledgment Letter No. AHU-AH.01.03-0928400 and No. AHUAH.01.03-0928392 dated April 29, 2015, respectively.

As a State-Owned Enterprise that engages in the natural gas downstream business, PGN conducts its business activities in the areas of natural gas transportation and trading. In the business of natural gas transportation, PGN has pipeline networks in North Sumatera, Southern part of Sumatera, Riau Islands, and the Java Sea to connect the natural gas sources location with the natural gas end-user location through the transmission pipelines mode. In the business of natural gas trading, PGN buys the natural gas from various natural gas Producers and then sells it to various natural gas end-user segments, for instance, Household Customers, Commercial Segment Customers, Industrial-Manufacture Customers, Power Plants, and Transportation Sectors, either distributed through pipelines, CNG or LNG. PGN provides an integrated natural gas infrastructure to support natural gas trading and ensures the quality of the natural gas (natural gas composition, pressure, temperature) and provide excellent services (customers contacts, disrupting handling) to its end customers. PGN divides its business activities into 4 (four) principal business segments, which are:

1. Natural gas transmission businesses
2. Natural gas trading business

3. Natural gas and oil business

4. Other businesses, i.e. telecommunication, services, constructions and maintenance of pipeline networks, building management, and financial lease align with the company's business strategy

Absorption Chiller

In the past decade, diffusion in small-scale technology has enabled the absorption of chillers to be economical-effective as well as for the size that is much needed by the market and the application of global warming and the tendency to increase energy consumption for AC purposes. The combined cycle system of natural gas (cogeneration) fuel is increasingly spreading throughout the world, especially on a small scale, because of the energy and environmental (and economic) benefits they can carry. This energy system can provide various types of energy vectors (electricity, cooling, and heat in the form of hot water and steam) with the potential energy savings of CHP and CCHP plants can also bring significant reductions in CO2 emissions. Moreover, it is supported by using 'cleaner' natural gas than coal or oil because of its lower carbon content. In this case, the integration of various energy sources and energy vectors is a topic of interest today. Besides, new markets are emerging worldwide to comply with the Kyoto Protocol's commitments, and Sustainability Development Goals (SDG).

Commercial Segment Customer

Service and Commercial Industry Customers are Customers who use Gas for non-commercial activities or services and/ or commercial/ commercial with Minimum Use per Month Contract above 1.000 (one thousand) m3, including government hospitals, health centers, orphanages, places of worship, government/ private educational institutions, religious institutions, government offices, social institutions and the like as well as hotels, restaurants/ restaurants, private hospitals, private offices, shops/ shophouses/ offices/ markets/ malls/ supermarkets, SPBBG/ CNG, traders/ area managers and similar commercial activities.

LITERATURE REVIEW

Capital Budgeting

When we start the new project, we have to consider the feasibility of that project. Many parameters that can define the feasibility of the new project. Another thing that important when we will start the new project is capital budgeting of new project itself. According to Ehrhardt (2011), capital budgeting is perhaps the most important task faced by financial managers and their staffs. Capital budgeting can define what the strategic direction for the company is. Before the project run by the company or even before the product or service sell or offer to the customer, it must be started with the capital budgeting. The result for capital budgeting will impact the long-term period, not for a short-term period. Mistakes in making capital budgeting will make to the negative financial impact for the company.

Capital budgeting requires many steps, but at the end of it, the objective is to simply look for projects that meet one criterion: they are worth more than they cost (Mark K, 2014). By this explanation, capital budgeting is an important way to choose the project which will give the benefit and can be implemented by the company. There are several steps that the company should run to define what project will be implemented. The important key is, that project gives more revenue compared with the cost spent.

There are several parameters that we should consider in developing capital budgeting of new projects that can be used to screen the new project whether we accept or reject. Net Present Value, Internal Rate of Return, Payback Period is some important parameters that we have to analyze before we accept the project.

Economic Analysis

Based on a book wrote by McAfee (2009), economics studies the allocation of scarce resources among people – examining what goods and services wind up in the hands of which people. Economic analysis is used in many situations. When British Petroleum sets the price for its Alaskan crude oil, it uses an estimated

demand model, both for gasoline consumers and also for the refineries to which BP sells. The demand for oil by refineries is governed by a complex economic model used by the refineries and BP estimates the demand by refineries by estimating the economic model used by refineries. Economic analysis was used by experts in the antitrust suit brought by the U.S. Department of Justice both to understand Microsoft's incentive to foreclose (eliminate from the market) rival Netscape and consumer behavior in the face of alleged foreclosure. Stock market analysts use economic models to forecast the profits of companies to predict the price of their stocks. When the government forecasts the budget deficit or considers a change in environmental regulations, it uses a variety of economic models.

As explained by Erickson (1996), starting a new business involves many steps. The first is to develop an economic analysis to determine whether there will be a profit or loss before starting production. If there is a projected profit based on the best available information, then a business plan should be developed. There are many plans available that can be used as guides. A good place to obtain assistance is one of the Small Business Development Centers located throughout the state. Starting a Home-Based Business is a very useful guide. It discusses ways for the business person to determine where the company is, where it wants to be, and how it plans to get there. A person can also register the business at the "First Stop Clearing house" within the Department of Commerce, which can provide answers concerning legal structure, employment, taxes, licensing, and some federal requirements.

Financial Planning

According to Ehrhardt (2011), the financial planning process generally involves five steps. The first step is the firm forecasts financial statements under alternative versions of the operating plan to analyze the effects of different operating procedures on projected profits and financial ratios. The second step is to determine the amount of capital that will be needed to support the plan. It finds out how much the new

assets needed to achieve the target sales will cost since, without adequate capital, the plan obviously cannot be realized. Next, the third step is firm forecasts the funds that will be generated internally. If internal funds are insufficient to cover the required new investment, then it must identify sources from which the required external capital can be raised, taking account of any constraints due to bond covenants that limit its debt ratio and other financial ratios. Market conditions must also be recognized.

The fourth step is, the firm establishes a performance-based management compensation system that rewards employees for creating shareholder wealth. The emphasis here should be on the long run, not on profits over the next few quarters or even years. A failure in this area was perhaps the most important factor leading to the worldwide financial and economic crisis that hit in 2008 and 2009. Finally, the last step is management must monitor operations after implementing the plan to spot any deviations and then take corrective actions. Computer software is helping greatly here, and it's changing the way companies do business. In particular, corporate information systems are reducing the need for "middle managers" and flattening firms' management structures. Those explanations above basically the steps that we must fulfill in making financial planning or financial projection especially in developing the new product before it sells to the customer.

RESEARCH METHODS

Net Present Value

Net Present Value is the sum of the present values of each of the cash flows (positive as well as negative) that occurs over the life of the project (Damodaran, 2014). The general formulation of the Net Present Value rule is as follows:

$$NPV \text{ of project} = \sum_{t=1}^n \frac{CF_t}{(1+r)^t} - \text{Initial Investment}$$

Figure 1. Net Present Value

Where:

CF_t = Cash flow in period t

r = Discount Rate

n = Life of project

For the example, below is the small project that has the first investment of \$1.000.000.000 and the cash that will be expected from that project is \$300.000.000 in the first year, \$400.000.000 in the second year, \$500.000.000 in the third year and \$600.000.000 in the fourth year. The discount rate assumption for this example is 12% and the Net Present Value for his project is described in the below figure.

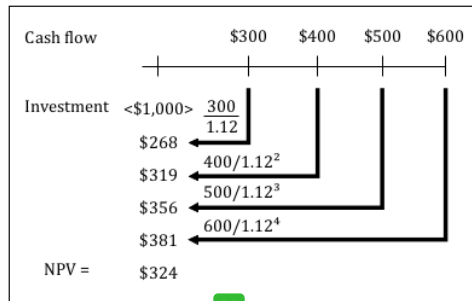


Figure 2. Net Present Value

The Net Present Value of the above example is \$324 million. Furthermore, we can define and decide the result of Net Present Value with the following condition:

- If the Net Present Value more than 0, we can accept the project
- If the Net Present Value below than 0, we can reject the project

The example of the project above resulted in the Net Present Value above or more than 0, so we can consider accepting the project.

Internal rate of return

The internal rate of return is the second parameters that we have to consider before running the project. In general terms, the Internal Rate of Return is that the discount rate that makes the Net Present Value of a project equal to 0 (Damodaran, 2014). We can get the Internal Rate of Return of the project by calculating in two alternatives, there are based on the cost of capital and based on the cost of equity. And the rules relating to the result of the Internal Rate of Return of the project are:

- If the Internal Rate of Return more than the cost of capital or cost of equity, we can consider

accepting the project

- If the Internal Rate of Return below than cost of capital or cost of equity, we can consider rejecting the project

The Internal Rate of Return is defined as the discount rate that equates the present value of a project's expected cash inflows to the present value of the project costs: $PV(\text{Inflow}) - PV(\text{Investment costs})$, or, equivalently, the Internal Rate of Return is the rate that forces the Net Present Value to equal zero (Ehrhardt, 2011). It means the Internal Rate of Return is the number generally in percentage (%) that will make the Net Present Value equal to zero. The higher the Internal Rate of Return of the project is will result in a better situation.

$$CF_0 + \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \dots + \frac{CF_n}{(1+IRR)^n} = 0$$

$$NPV = \sum_{t=0}^n \frac{CF_t}{(1+IRR)^t} = 0$$

Figure 3. Internal Rate Return

Where:

- CF_t = Cash flow in period t
- IRR = Internal Rate of Return
- n = Life of project

Payback Period

The payback on a project is a measure of how quickly the cash flows generated by the project cover the initial investment (Damodaran, 2014). Below is the example of the cash flows generated by the project in a certain period.

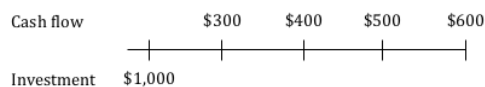


Figure 4. Payback Period

By looking at the cash flows generated in the above figure, the payback period of that project is fall in between year two and year. Considering the investment is \$1000, the cash flows of that project can cover the cost of investment after the second year and before the third year, since between that periods, the cumulated cash flows

in the range between \$700 and \$1200. So approximately after 2.6 years the investment already covered from cash flows generated.

Table 1. Cash Flow Generated

Year	Cash Flow in Year	Cumulated Cash Flow
0	-\$1.150.000	
1	\$340.000	-\$810.000
2	\$415.000	-\$395.000
3	\$446.500	\$51.500
4	\$720.730	\$772.300

According to the table 1, the project will need an investment cost of \$1.150.000. In the first year, the project will generate cash flows of \$340.000, in the second year will generate cash flows of \$415.000, in the third year will generate cash flows of \$446.000 and fourth year will be generated cash flows of \$720.730. Based on that cash flows generated, the unrecovered cost of investment in the first year is \$810.000. We can get this number by subtracting the investment cost with the cash flow generated in the first year. Furthermore, the unrecovered cost of investment

in the second year is \$395.000. In the third year, the accumulated cash flow generated already fully covered the investment cost and resulted in a positive number of \$51.500. So, the payback period is fall between the second and third year of the project implementation. Using the below equation, we can get the payback for the project.

$$\text{Payback Period} = \text{Number of years prior to full recovery} + \frac{\text{Unrecovered cost at start of year}}{\text{Cash flow during full recovery year}}$$

Figure 5. Payback Period

RESULTS AND DISCUSSION

Product Tariff

Our product GasCool, Gas for absorption chiller (air conditioning and water heater). Before we explain the financial analysis of product implementation, the important thing that we have to define is how much the tariff also the tariff structure of the product. The tariff structure consists of capital expenditure, gas cost, operational expenditure, tax, and return/margin.

The valuation of 1 chiller can described in below figure:

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
VALUATION										
EBITDA	1,434	1,376	1,329	1,257	1,196	1,133	1,080	1,003	935	877
Interest Expense	(319)	(299)	(219)	(139)	(60)					
Tax	(152)	(143)	(151)	(153)	(158)	(157)	(144)	(124)	(107)	(93)
Capex	(5,054)	-	-	-	-	-	-	-	-	-
Free Cash Flow (IDR thousand)	(4,092)	934	958	965	979	976	936	878	828	784
	-4,092	-3,157	-2,199	-1,234	-255	721	1,657	2,535	3,363	4,147
Payback Period	5.26	0.00	0.00	0.00	0.00	0.00	5.26	0.00	0.00	0.00

VALUE @Year 1

WACC Calculation	
Cost of Equity (%)	12.06%
Equity (IDR)	1,516,200,000
Cost of Debt (%)	6.67%
Debt (IDR)	3,537,800,000
Debt + Equity (IDR)	5,054,000,000
WACC (%)	8.28%
IRR Project	17%
Tariff (Rp/TR)	1597
NPV (Rp Billion)	1,497

Figure 6. Valuation 1 Chiller

Using 1 chiller as a base of price calculation and 10-year financial projection the tariff of this product is Rp1.597/TR and the structures are:

- a. Capital Expenditure : Rp199/TR
- b. Gas Cost : Rp932/TR
- c. Operational Expenditure : Rp100/TR
- d. Tax : Rp60/TR
- e. Return / Margin : Rp306/TR

Total : Rp1.597/TR

Customer Benefit

Furthermore, we have to define the benefit usage of this product in terms of the customer perspective. In the customer perspective, the usage of this product will reduce the cost of air conditioning up to 14.6% or equivalent to Rp707 million if compare with the electrical regular chiller usage. The calculation is described in the table 2. It explains the comparison between electric regular chiller and gas absorption chiller.

Table 2. Operating Cost Comparison

No	Items	Electrical Regular Chiller	BROAD Absorption Chiller (Cooling Only)
1.	Cooling load (kW)	1744	1744
	Cooling energy resource	Electricity	Electricity
	Daily operation hours	14	14
	Operation days	365	365
	COP	4.25	1.42
2.	Operation Cost Calculation - Electricity		
	Total Electrical Consumption Chiller (kW/h)	410	10
	Electricity Use/Day (kW)	5.476,364235	138.6
	Electricity Use/Year (kW)	2.097.423	50.589
	Electricity price Rp/kWh	1.761	
	Electric Cost/Day	10.121.047,85	244.115,61
	Electric Cost/Year	Rp3.694.182.466	Rp89.102.199
	Total Electricity Cost (Rp/Year)	Rp3.694.182.466	Rp89.102.199
	Difference Total Electricity Cost (Rp/Year)		Rp(3.605.080.267)
3.	Operation Cost Calculation - Natural Gas		
	Gas Consumption (M3/Hours)	-	110
	Gas Consumption (M3/Year)	-	562,258
	Gas Price (Rp/M3)	4.200	4.200
	Gas Consumption (Rp/Hours)	-	462,130
	Total Gas Consumption (Rp/Year)	-	-
	Difference Total Gas Consumption (Rp/Year)	-	-
4.	Operation Cost Calculation - Chiller System		
	TR Usage (TR/Year)	2.534.560	2.534.560
	Chiller System Price (Rp/TR)	Rp453,59	Rp1.597
	Total Chiller Cost (Rp/Year)	Rp1.149.663.119	Rp4.046.802.908
	Difference Total Chiller Cost (Rp/Year)	-	Rp2.897.139.789
5.	Cost Calculation		
	Total Cost (Rp/Year)	Rp4.843.845.585	Rp4.135.905.107
	Difference Total Cost (Rp/Year)	-	(707.940.479)
	%	-14.6%	

As we can see, the total cost that customer have to spent per year if they use electric regular chiller is Rp4.8 billion per year consist of Rp3.7 billion for electric cost and Rp1.1 billion for electric chiller cost itself including maintenance cost while gas, when the customer use absorption chiller, the total cost that customer have to spend per year is Rp4.1 billion per year which consist of Rp0.9 billion for electric cost and Rp4 billion for absorption chiller cost itself. So, there is Rp707 saving cost if customer use absorption chiller. This condition will help the sales team when they want to sell this product. Since the cost saving is very dependent to the electric cost define by PLN, so this product is competitive compare with electric chiller if electric cost above Rp1.180/Kwh.

Assumption:

- Cost of absorption chiller utilization Rp1.597/TR
- Chiller Capacity 495 TR
- Volume and electricity reference source from Broad Manual Book
- Electric cost based on PLN Tariff Rp1.467/Kwh

In the current condition, as explained in the figure 7, the customer still can enjoy the cost-saving if the electric cost is above Rp1.180/kwh and if the electric cost will increase in the future, the cost-saving that customer will get increases also.

The sensitivity analysis of the electric cost described in figure 7:

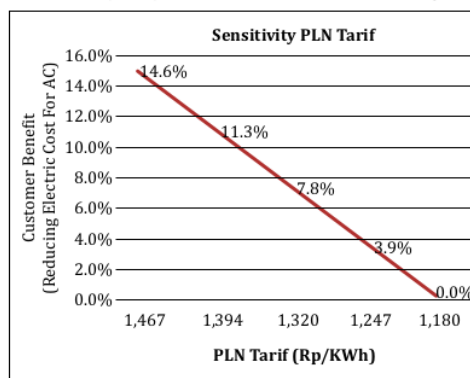


Figure 7. Sensitivity PLN Tariff

Financial Projection

Using the 10 years financial projection and with sales forecast also, by implementing this project, the company will get additional revenue Rp28.1 billion in the first-year implementation with 5 operating chillers. On the other hand, since absorption chiller uses gas to operate, there is additional revenue in gas consumption for the company Rp16.5 billion in the first year. This Internal Rate of Return of this project is 17.6% with the payback period is 5.5 years. The detail calculation of the financial projection is reflected in the figure 8, 9 and 10 (in Rp Million).

INCOME STATEMENT	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Volume	17,598,427	21,759,181	26,930,323	33,363,247	41,373,273	51,356,222	63,809,364	79,357,910	98,788,541	123,091,866
Tariff	1,597	1,597	1,597	1,597	1,597	1,597	1,597	1,597	1,597	1,597
Revenue	28,104	34,748	43,006	53,279	66,071	82,013	101,900	126,730	157,760	196,571
Gas Purchase	(16,571)	(20,899)	(26,383)	(33,339)	(42,170)	(53,391)	(67,665)	(85,836)	(108,990)	(138,519)
Operating Expense	(1,516)	(1,840)	(2,439)	(3,062)	(3,710)	(4,647)	(5,884)	(7,433)	(9,045)	(11,509)
Depreciation	(3,032)	(6,065)	(9,097)	(12,130)	(15,162)	(18,194)	(21,227)	(24,259)	(27,292)	(30,324)
Total Operating Expense	(21,120)	(28,803)	(37,919)	(48,530)	(61,042)	(76,233)	(94,776)	(117,529)	(145,326)	(180,352)
Operating Profit	6,984	5,945	5,088	4,749	5,029	5,780	7,124	9,202	12,434	16,219
EBITDA	10,016	12,010	14,185	16,879	20,191	23,975	28,351	33,461	39,725	46,543
Other income/expense										
Finance Cost	(1,913)	(1,793)	(1,314)	(836)	(358)	-	-	-	-	-
Other income/expense										
Total	(1,913)	(1,793)	(1,314)	(836)	(358)	-	-	-	-	-
Profit Before Tax	5,071	4,152	3,773	3,913	4,672	5,780	7,124	9,202	12,434	16,219
Tax Expense	(1,268)	(1,038)	(943)	(978)	(1,168)	(1,445)	(1,781)	(2,300)	(3,108)	(4,055)
Net Income	3,803	3,114	2,830	2,935	3,504	4,335	5,343	6,901	9,325	12,164

Figure 8. Financial Projection (1)

Wisnu Haryadi, Yulita Fairina Susanti / Economic Analysis of New Product (Gas for Absorption Chiller in Commercial Segment Customer) / 111- 121

2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
2020 BALANCE SHEET									
Current Assets									
Cash	6,835	5,654	2,166	1,816	5,067	12,435	18,789	24,679	38,083
Receivable	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Total	6,835	5,654	2,166	1,816	5,067	12,435	18,789	24,679	38,083
Non Current Assets									
Fixed Assets- Net	27,292	26,281	27,292	25,270	20,216	17,184	16,173	17,184	15,162
2020 Opening Amount	30,324	35,378	45,486	55,594	65,702	80,864	101,080	126,350	151,620
Accumulated depreciation	(3,032)	(9,097)	(18,194)	(30,324)	(45,486)	(63,680)	(84,907)	(109,166)	(136,458)
Other	-	-	-	-	-	-	-	-	-
Total Non Current Assets	27,292	26,281	27,292	25,270	20,216	17,184	16,173	17,184	15,162
Total Assets	34,127	31,935	29,458	27,086	25,283	29,618	34,961	41,863	51,188
LIABILITIES									
Current Liabilities									
Trade Payable	-	-	-	-	-	-	-	-	-
Other Payable	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-
Non Current Liabilities									
Long Term Loan	21,227	15,920	10,613	5,307	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Total	21,227	15,920	10,613	5,307	-	-	-	-	-
Total Liabilities	21,227	15,920	10,613	5,307	-	-	-	-	-
Shareholder Equity									
Share stock	9,097	9,097	9,097	9,097	9,097	9,097	9,097	9,097	9,097
Retained Earning	3,803	6,917	9,747	12,682	16,186	20,521	25,864	32,766	42,091
current earning	3,803	3,114	2,830	2,935	3,504	4,335	5,343	6,901	9,325
dividen	-	-	-	-	-	-	-	-	-
Total Shareholder Equity	12,900	16,015	18,844	21,779	25,283	29,618	34,961	41,863	51,188
Total Liabilities and Equity	34,127	31,935	29,458	27,086	25,283	29,618	34,961	41,863	51,188

Figure 9. Financial Projection (2)

2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Cash Flow Statement									
Cash from Operation									
Cash Receipt from Customer	28,104	34,748	43,006	53,279	66,071	82,013	101,900	126,730	157,760
Cash Paid To Supplier	(16,571)	(20,899)	(26,383)	(33,339)	(42,170)	(53,391)	(67,665)	(85,836)	(108,990)
Operational Expense	(1,516)	(1,840)	(2,439)	(3,062)	(3,710)	(4,647)	(5,884)	(7,433)	(9,045)
Interest Expense	(1,913)	(1,793)	(1,314)	(836)	(358)	-	-	-	-
Tax Expense	(1,268)	(1,038)	(943)	(978)	(1,168)	(1,445)	(1,781)	(2,300)	(3,108)
Others Expense	-	-	-	-	-	-	-	-	-
Total	6,835	9,179	11,927	15,064	18,666	22,530	26,570	31,161	36,617
Cash from Investing									
Fixed Assets	(30,324)	(5,054)	(10,108)	(10,108)	(10,108)	(15,162)	(20,216)	(25,270)	(40,432)
Other	-	-	-	-	-	-	-	-	-
Total	(30,324)	(5,054)	(10,108)	(10,108)	(10,108)	(15,162)	(20,216)	(25,270)	(40,432)
Cash from Financing									
proceed from borrowing	21,227	-	-	-	-	-	-	-	-
loan payment	-	(5,307)	(5,307)	(5,307)	(5,307)	-	-	-	-
additional shares	9,097	-	-	-	-	-	-	-	-
dividen payment	-	-	-	-	-	-	-	-	-
Total	30,324	(5,307)	(5,307)	(5,307)	(5,307)	-	-	-	-
Net Cash	6,835	(1,182)	(3,488)	(350)	3,251	7,368	6,354	5,891	11,347
Beginning balance	-	6,835	5,654	2,166	1,816	5,067	12,435	18,789	24,679
Ending Balance	6,835	5,654	2,166	1,816	5,067	12,435	18,789	24,679	36,026

Figure 10. Financial Projection (3)

Moreover, for the detail calculation of the **Internal Rate of Return** and **Payback Period** is explained in figure 11. Meanwhile, another thing that we have to analyze is about the sensitivity analysis relating to the sales forecast of this project. We use 90%

until 110% of sales forecast and what will the impact for the Revenue, EBITDA and Net Income, IRR and also payback period in 10 years financial projection. The details are explained in the figure 12.

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
VALUATION										
EBITDA	10,016	12,010	14,185	16,879	20,191	23,975	28,351	33,461	39,725	46,543
Interest Expense	(1,913)	(1,793)	(1,314)	(836)	(358)	-	-	-	-	-
Tax	(1,268)	(1,038)	(943)	(978)	(1,168)	(1,445)	(1,781)	(2,300)	(3,108)	(4,055)
Capex	(30,324)	(5,054)	(10,108)	(10,108)	(10,108)	(15,162)	(20,216)	(25,270)	(25,270)	(40,432)
Free Cash Flow	(23,489)	4,125	1,819	4,956	8,558	7,368	6,354	5,891	11,347	2,056
Cumulative Cash Flow	-23,489	-19,363	-17,544	-12,588	-4,030	3,337	9,691	15,582	26,929	28,985
	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
Payback Period	5.55	0.00	0.00	0.00	0.00	5.55	0.00	0.00	0.00	0.00
VALUE @Year 1										
WACC Calculation										
Cost of Equity (%)	12.06%									
Equity (IDR)	9,097,200,000									
Cost of Debt (%)	6.67%									
Debt (IDR)	21,226,800,000									
Debt + Equity (IDR)	30,324,000,000									
WACC (%)	8.28%									
IRR Project	17.61%									
NPV	10,410.55									

Figure 11. Payback Period and Internal Rate Return

(In Rp Mio)												
Volume (Projected Volume)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	IRR	Payback Period (Year)
Revenue	90%	25,293	31,273	38,706	47,951	59,464	73,812	91,710	114,057	141,984	4.6%	7.83
	95%	26,699	33,011	40,856	50,615	62,767	77,913	96,805	120,394	149,872	11.9%	6.26
	100%	28,104	34,748	43,006	53,279	66,071	82,013	101,900	126,730	157,760	17.6%	5.50
	105%	29,509	36,486	45,157	55,943	69,375	86,114	106,995	133,067	165,648	22.6%	5.10
	110%	30,914	38,223	47,307	58,607	72,678	90,215	112,090	139,403	173,536	27.2%	4.77
EBITDA	90%	8,863	10,625	12,522	14,885	17,801	21,113	24,928	29,372	34,848	4.6%	7.83
	95%	9,440	11,317	13,354	15,882	18,996	22,544	26,639	31,416	37,287	11.9%	6.26
	100%	10,016	12,010	14,185	16,879	20,191	23,975	28,351	33,461	39,725	17.6%	5.50
	105%	10,593	12,702	15,016	17,876	21,386	25,406	30,063	35,506	42,164	22.6%	5.10
	110%	11,170	13,395	15,847	18,873	22,581	26,837	31,775	37,550	44,602	27.2%	4.77
Net Income	90%	2,938	2,076	1,448	1,177	1,491	2,037	26,691	3,809	5,668	4.6%	7.83
	95%	3,371	2,595	2,206	2,119	2,544	3,216	4,030	5,355	7,497	11.9%	6.26
	100%	3,803	3,114	2,830	2,935	3,504	4,335	5,343	6,901	9,325	17.6%	5.50
	105%	4,236	3,634	3,453	3,683	4,400	5,409	6,627	8,435	11,154	22.6%	5.10
	110%	4,668	4,153	4,077	4,430	5,296	6,482	7,911	9,968	12,983	27.2%	4.77

Figure 12. 10 years Financial Projection

2

CONCLUSION

Based on the analysis explained in the previous chapter, GasCool is feasible to be implemented and it will generate the benefits. PGN will get 17.6% on IRR and 5.5 years payback period. PGN will get additional revenue, especially from commercial customer segment Rp28 billion in 2019 and increase to Rp196 billion in 2028 based on financial forecasting. From the additional revenue, PGN will get an additional net income Rp4 billion in 2019 and increase to 12 billion in 2019. This benefit is come from selling the product

only, not including additional revenue generated from selling the gas for the GasCool.

Furthermore, Using GasCool, the customer will save electricity cost up to Rp707 million per year for the air conditioner and Rp190 million per year for the water heater. Customer will get the benefit as mentioned above because they use less electricity to operate the absorption chiller compared to electric chiller since the electricity tariff is more expensive and historically it increases every year.

REFERENCES

- Damodaran, A. (2014). *Applied Corporate Finance Fourth Edition*. Wiley.
- Ehrhardt, M. C. (2002). *Corporate Finance : A Focused Approach*. Cengage South-Western.
- Ehrhardt, M. C. (2011). *Corporate Finance: A Focus Approach*. South Western Cengage Learning.
- Erickson, D. (1996). *Economic Analysis of a New Business*. 1.
- Mark K, P. (2014). *Applied Corporate Finance*. New York: Springer.
- McAfee, P. (2009). *Introduction to Economic Analysis*. Saylor Foundation.

Economic Analysis of New Product (Gas for Absorption Chiller in Commercial Segment Customer)

ORIGINALITY REPORT

19%
SIMILARITY INDEX

14%
INTERNET SOURCES

7%
PUBLICATIONS

10%
STUDENT PAPERS

PRIMARY SOURCES

1 www.agrisk.umn.edu 2%
Internet Source

2 www.researchgate.net 2%
Internet Source

3 oer.lib.polyu.edu.hk 1%
Internet Source

4 Chicco, G.. "A unified model for energy and environmental performance assessment of natural gas-fueled poly-generation systems", Energy Conversion and Management, 200808 1%
Publication

5 people.stern.nyu.edu 1%
Internet Source

6 Submitted to Kaplan College 1%
Student Paper

7 businessdocbox.com 1%
Internet Source

8 repository.ub.ac.id
Internet Source

1 %

9

Mark K. Pyles. "Applied Corporate Finance",
Springer Nature, 2014

Publication

1 %

10

islamicmarkets.com

Internet Source

1 %

11

Submitted to Fakultas Ekonomi dan Bisnis
Universitas Gadjah Mada

Student Paper

1 %

12

Submitted to American Intercontinental
University Online

Student Paper

1 %

13

fmipa.unsrat.ac.id

Internet Source

1 %

14

Submitted to Kardan University

Student Paper

1 %

15

Agus Sugiyono, Adiarso. "Development of
Natural Gas Infrastructure to Enhance
National Energy Security in Indonesia", IOP
Conference Series: Materials Science and
Engineering, 2021

Publication

<1 %

16

Submitted to Kenyatta University

Student Paper

<1 %

Submitted to University of Aruba - Tii

17

Student Paper

<1 %

18

books.mec.biz

Internet Source

<1 %

19

uilis.unsyiah.ac.id

Internet Source

<1 %

20

ebin.pub

Internet Source

<1 %

21

inba.info

Internet Source

<1 %

22

Submitted to Adtalem Global Education, Inc.

Student Paper

<1 %

23

Submitted to Intercollege

Student Paper

<1 %

24

K G W Budiarta, D W Handani, A A B
Dinariyana. "Quantitative Risk Assessment of
LNG Terminal", IOP Conference Series: Earth
and Environmental Science, 2020

Publication

<1 %

25

Submitted to Universitas Pelita Harapan

Student Paper

<1 %

26

trisulatextile.com

Internet Source

<1 %

27

webhome.auburn.edu

Internet Source

<1 %

28	valutico.com Internet Source	<1 %
29	Frederick C. Scherr. "Credit-Granting Decisions Under Risk", The Engineering Economist, 2007 Publication	<1 %
30	www.slideshare.net Internet Source	<1 %
31	PKF International Ltd. "Wiley IFRS 2017 Interpretation and Application of IFRS Standards", Wiley, 2017 Publication	<1 %
32	www.authorstream.com Internet Source	<1 %
33	Michael Samonas. "Financial Forecasting, Analysis, and Modelling", Wiley, 2015 Publication	<1 %
34	arbitrationblog.kluwerarbitration.com Internet Source	<1 %
35	www.gsa.gov Internet Source	<1 %
36	Masood Ebrahimi. "Economics of power generation", Elsevier BV, 2023 Publication	<1 %

Exclude quotes Off

Exclude matches Off

Exclude bibliography Off