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Implementation of 5G Telecommunication Network Services in Indonesia based on Techno-economic Analysis

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Abstract*— The 2300 MHz spectrum is a medium band that telco operators will not pay much attention to when they deploy 5G. They are more comfortable at 2.6 GHz, 3.5 GHz, 26 GHz, and 28 GHz, in addition to 700 MHz for the breadth of coverage. The performance of cellular telecommunications services based on 5G technology is possible for new operators, although it will be carried out as stand-alone services. This opportunity will be taken by looking at internet subscriber data/data communication from existing operators as active internet users, which is quite large and has a potential of over 250 million users. There has been no previous study regarding the feasibility of deploying this 5G technology-based Broadband Wireless Access (BWA) Network. Based on the experience of implementing previous generations of telecommunication service technology, the government and operators need to be careful in determining the right moment to deploy this 5G technology service, which is predicted to be able to provide broadband services with streaming capabilities of 10 to 100 times the streaming speed of 4G technology. It should be noted that the lack of success of 3G performances in 2006 from 2G, 2.5G, and 2.75 G. Almost all operators who were expected to be very lucky turned out to be not optimal; even now, only 4 operators are playing on 3G. where they have not been able to force users of the 2G generation to switch to 3G, including in big cities where the performance of the 3G network is not yet optimal and evenly distributed. Still, many areas are blank spots from 3G networks and services. From this experience, scientific studies are needed to ensure the feasibility of the upcoming 5G BWA business and identify business opportunities that can be implemented. The feasibility analysis must be viewed from various aspects, namely aspects of technical readiness, market aspects, and financial aspects in terms of the techno-economics of the operators who will provide 5G telecommunications services by calculating several essential parameters as a measure of business feasibility, namely Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PBP).

***Keywords*— 5G; frequency 3.3 GHz; techno-economy.**

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I. INTRODUCTION

In general, 5G technology has various advantages over 4G. Its advantages include 50 times faster 5G speeds, ten times more responsiveness, and much lower connectivity power than 4G technology [1]. These things are available thanks to a combination of the following three features: high throughput, very low latency, and low power connectivity. Increased speed, low latency, and connectivity will help telecommunications operators provide super-fast Internet connections for streaming high-definition (HD) video, cloud gaming, and interactive content based on augmented reality and virtual reality (AR/VR) for their customers [1], [2]. The government's policy direction through the Ministry of Communication and Information of the Republic of Indonesia indicates that the frequency to be designated as the official new radio frequency in the performance of the Broadband Wireless Access telecommunication network with 5G technology is 3300 MHz - 3400 MHz [3]. Based on the results of the 2019 World Radiocommunication Conference, as written in the GSMA, the use of the 3.3 GHz - 4.2 GHz band for cellular broadband has become the subject of harmonization activities at various points in the last fifteen years both at the International Telecommunication Union (ITU) and in Europe / CEPT (European Conference of Postal and Telecommunications Administrations). Meanwhile, ASMG (Arab Spectrum. Management Group) announced plans in December 2018 to move ahead of the ITU harmonization process to a 3.3-3.8 GHz range for IMT [4].

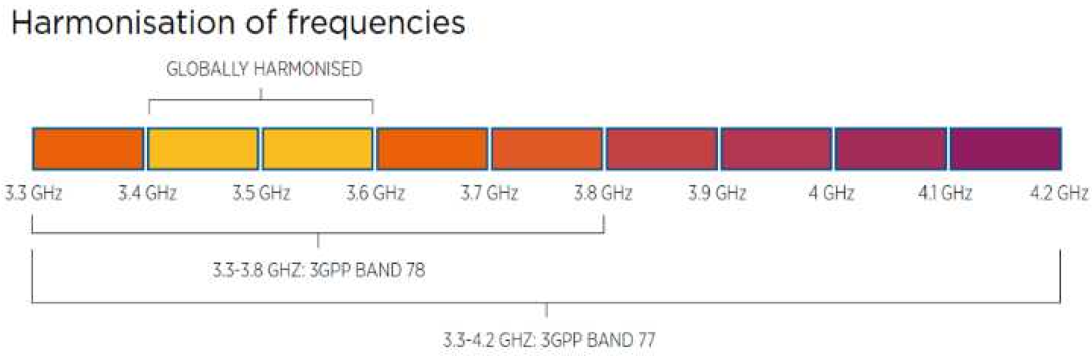

Fig. 1 Frequency Harmonization 3.3 GHz- 4.2 GHz

The new technology will open up more business opportunities, including for new operators who receive licenses for the 3.3-3.4 GHz frequency to become Broadband Wireless Access (BWA) service providers. This 5G BWA performance is very likely to be carried out by new operators, although it will be carried out as stand-alone services. This opportunity will be taken by looking at internet subscriber data/data communication from existing operators as active internet users, which is quite large and has a potential of over 250 million users. There has been no previous study regarding the feasibility of deploying this 5G technology-based Broadband Wireless Access (BWA) Network [5]–[8]. Based on the experience of implementing previous generations of telecommunication service technology, the government and operators need to be careful in determining the right moment to deploy this 5G technology service, which is predicted to be able to provide broadband services with streaming capabilities of 10 to 100 times the streaming speed of 4G technology.

It should be noted that the lack of success of 3G performances in 2006 from 2G, 2.5G, and 2.75 G. Almost all operators who were expected to be very lucky turned out to be not optimal; even now, only four operators are playing on 3G [8]–[11]. They have not been able to force users of the 2G generation to switch to 3G, including in big cities where the performance of the 3G network is not yet optimal and evenly distributed. Still, many areas are blank spots from 3G networks and services. From this experience, scientific studies are needed to ensure the feasibility of the upcoming 5G BWA business and identify business opportunities that can be implemented.

The feasibility analysis must be viewed from the technical readiness aspect, market aspect, and techno-economic financial aspect of the operator who will provide the 5G telecommunication service by calculating several important parameters of feasibility measure, namely Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PBP) [12], [13].

II. Materials and Method

The research will be carried out in 5 stages: literature study stage, data collection and market identification stage, 5G service area planning stage, technical analysis stage, and economic analysis stage. The methodology and steps for conducting the research are described in Figure 2.

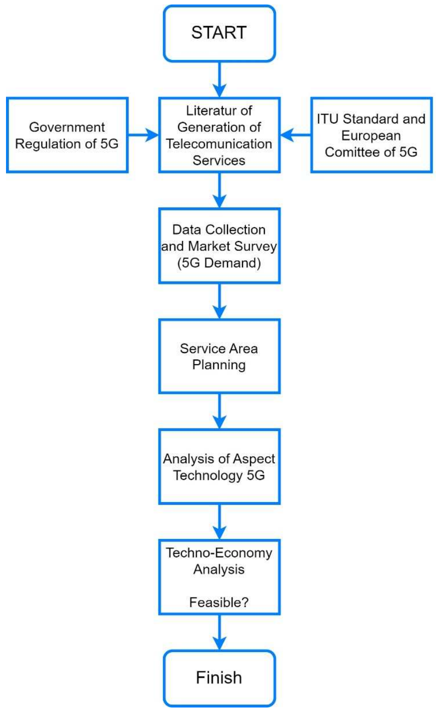

Fig. 2 Research Methodology

A. *Broadband Wireless Access Based on 5G Technology*

The 5G network has been available in several regions in the United States since 2018. The latest generation network has also been confirmed to be widely used in 2020. 5G is a mobile internet connectivity network that offers a faster connection than the previous generation. Due to its high speed, 5G is also expected to carry large amounts of data to connect the world more quickly and efficiently [5]. According to Digital Trends, unlike 4G or LTE networks, 5G can be used in three types of spectrum: low-band, mid-band, and high-band. Low-band does offer a large area, but it has the disadvantage that the maximum data speed is only up to 100Mbps. For the mid-band, the speed only reaches 1Gbps. High-band is considered very suitable for 5G because it can transfer data up to 10Gbps, but the main problem is that the coverage area is not wide enough. Even if the maximum speed is so large, the actual speed will not be the same. User download speed is estimated at 100Mbps, and upload speed is 50Mbps [5]–[8]. This network is also expected to assist in increasing the application of Internet of Things (IoT) technology in various fields in the world. IoT is a concept of interrelated computing and the ability to transfer data over a network without requiring human-to-computer interaction. IoT is useful in tracking logistics, smart cities, smart buildings, and agriculture. According to the GSMA, 5G could reach as many as 1.2 billion connections by 2025. It is also predicted that 5G networks will cover a third of the world's population. Mobile phone companies like Samsung have now released phones that can serve 5G networks in many countries. Apart from the US, other countries, such as South Korea, Japan, and China, were the first countries to provide 5G networks commercially. The 5G network architecture is shown in Figure 3 [4], [5].

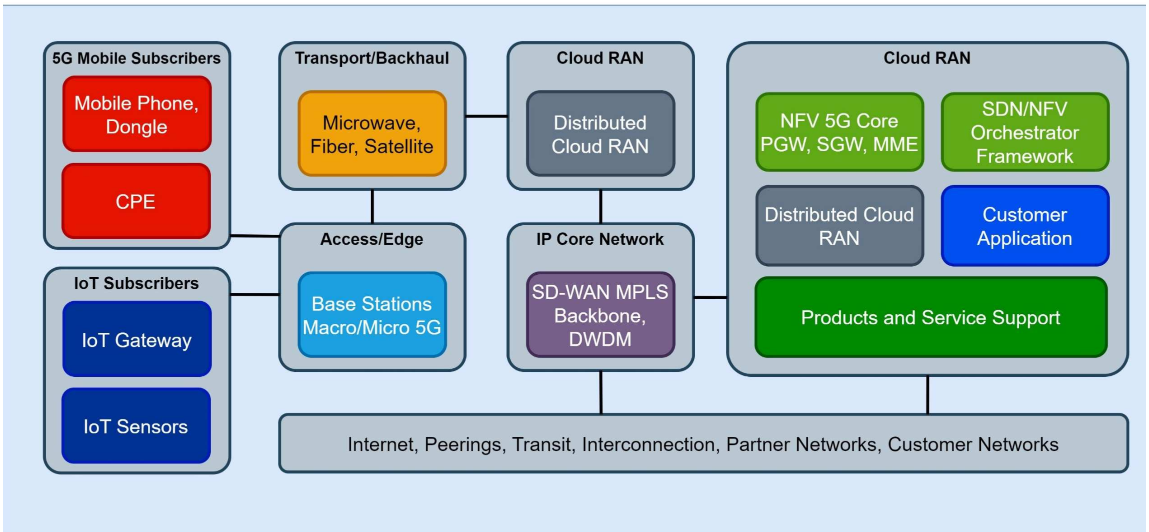

Fig. 3 Network Architecture of 5G

HetNet refers to providing a cellular network through a combination of different cell types (e.g., macro, pico, or femtocells) and different access technologies (i.e., 2G, 3G, 4G, Wi-fi)[14]. By integrating several technologies that vary depending on the topology of the coverage area, operators can potentially provide a more consistent customer experience than would be possible with homogeneous networks. HetNet infrastructure evolution in 5G technology [4], [5], [7]:

1) *Small Cells*: Placing four small cells in one macro provides more than 50 percent data offload and increases macro network performance by 315 percent[15].

2) *Cloud RAN*: C-RAN is a new cellular network architecture based on cloud computing.

3) *D2D (Device to Device) Communication:* Illustrations can be seen in Figure 4.

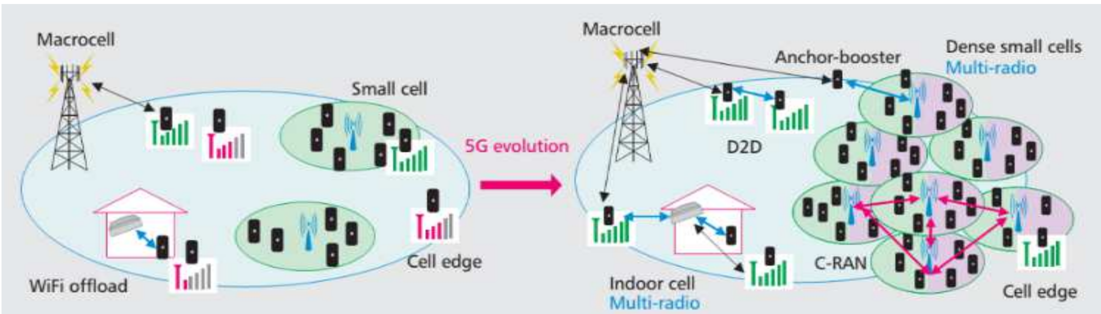

Fig. 4 The evolution of heterogeneous networks (HetNets) infrastructure

B. Net Present Value (NPV), Internal Rate Return (IRR), Payback Period (PBP)

Net Present Value (NPV) is the difference between the discounted expenditure and income using the social opportunity cost of capital as a discount factor. In quantitative selection criteria, the net present value method is often considered the best, so it is often used to assess the feasibility of an investment proposal. The present value (PV), which is summed over the lifetime of the project, can be calculated by equations [13], [16]–[18].

$$PV = Rt / (1 + i)t \qquad (1)$$

t: cash flow time
i: discount rate used Rt: the net cash flow in time t or using equation (2) below.

$$NPV = PV\ Benefit - PV\ Cost$$
$$NPV = \sum Nn = 0\ (Rn - Cn)\ (p/f, i\%\ n) \qquad (2)$$

Rn: cash inflow
Cn: cash outflow
(p / f, i% n): present and future factors with interest rate i%

The decision-making criteria are as follows:

- If NPV > 0, then the investment made benefits the company.

- If NPV < 0, the investment made will cause losses to the company.
- If NPV = 0, then the investment made does not cause profit or loss to the company.

IRR is an indicator of the efficiency level of investment; in other words, IRR is the value of the discount rate that makes the NPV of the project equal to zero. The discount rate used to find the present value of a cost or benefit must be equal to the opportunity cost of capital, as seen from the point of view of project appraisal. A project can be carried out if the rate of return is greater than the rate of return if the investment is made elsewhere (interest on bank deposits, mutual funds, etc.). IRR can be calculated using equation 3 [13], [16]–[18].

$$\text{PW } of\ Benefit = \text{PW } of\ Cost$$
$$\sum_{n=0}^{N}(Rn - Cn)\left(\frac{P}{f}, i\%n\right) = \sum_{n=0}^{N}(Cn)\left(\frac{P}{f}, i\%n\right) \quad (3)$$
$$IRR = i2\ \frac{PV1\,(r2-r1)}{PV2-PV1}$$

The payback period is a method used to calculate how long it will take to return the investment value (return on investment). This method is not used as the main tool but only as an indicator of liquidity and investment risk. The payback period calculation can be done using equations 4 [14], [16], and [16], [18]–[23].

$$Payback\ period = t + \frac{x-z}{y-z}\ x\ 1\ year$$
$$Payback\ period = \frac{initial\ investment}{Cash\ Flow}\ x\ 1\ year \quad (4)$$

Information:
t = the last year in which the cash flow still cannot cover the initial investment
x = amount of initial investment
z = cumulative amount of cash flows in year n
y = cumulative amount of cash flows in year n+1

III. Result and Discussion

Estimated demand can be calculated by estimating the capacity of a 5G node that is built together with other companies and multiplying the number of BTS that must be owned. Following are the Details of 8T8R Capacity Planning. The results of demand estimation and detailed capacity planning are shown in Table 1.

TABLE I
DEMAND ESTIMATION

8T8R Detail Capacity Planning (1x3x1 25MHz, DL 4X2, UL 1x4)				
	Item	**DL**	**UL**	**Remark 1**
PS Traffic	PS User Experience @ BH (Kbps)	4196	954	A1(Input)
	Device Power On Ratio (Online Subs)	50%	50%	A2(Input)
	RRC Connected Sub Ratio in BH	20%	20%	A3(Input)
	Active/Duty Ratio	30%	30%	A4(Input)
	Contention Ratio	3.0%	3.0%	B=A2*A3*A4
	PS Average Throughput per user in BH(kbps)	125.88	28.61	C1=A1*B
VoLTE Traffic	Voice User Penetration Ratio	20%	20%	A5(Input)
	BHCA for Voice	1	1	A6(Input)
	Voice Erlang per Sub(Erl)	0.012	0.012	A7(Input)
	Voice Bearer rate(kbps)	88	88	A8(Input)
	Equivalent Voice Average Throughput per user in BH(kbps)	0.21	0.21	C2=A5*A6*A7*AB
Capacity Estimation	Mix Average Throughput per user of the whole network in BH(kbps)	126.09	28.82	C3=C1+C2
	Average Throughput per S111 Site(Mbps)	2619.2	595.28	D
	Subscribers Count per S111 Site	21272	21151	E1= D*1024/C3
	Final Subscribers Count per S111 Site	21,151		E2=Min(DL,UL) of E1
	Site Count Plan			F
	Total Subscribers Request			G=E2* F

Then, the number of BTS that the company must own to provide 5G networks throughout Indonesia is shown in Table 3. The number of site count plans built in 2020 to 2029 BTS Pico Cell, MicroCell, Macro Cell. The estimated number of customer demands or requests is in Table 1, and the result of the SWOT analysis is shown in Table 2.

TABLE II
SWOT ANALYSIS

Strengths	**Weaknesses**
a. Exponential Market Growth	a. Operational Costs
b. Focus only on 5G Network	b. Splitting Network with Other Competitors
c. Reasonable Pricing	
Opportunities	**Threats**
a. Increase Customer Base	a. Competition
b. Collaboration with existing providers	b. Have no Existing Infrastructure
	c. Cannot Reach the Required Minimum BHP Frequency License.

TABLE III
BTS PLANNING 2020-2029

	Number of 5G Pico Cell eNodeB BTS (accumulation)	Number 5G Micro Cell eNodeB BTS (accumulation)	Number of 5G Macro Cell eNodeB BTS (accumulation)	Total Site Count Plan	Total Subscriber Request
2020	-	-	36	36	761,436
2021	-	-	756	756	15,990,156
2022	-	-	962	962	20,347,262
2023	18,025	8,560	12,220	38,805	820,761,584
2024	21,308	13,223	16,194	50,725	1,072,877,963
2025	23,698	14,517	20,908	59,123	1,250,512,853
2026	26,016	14,887	23,830	64,733	1,369,174,990
2027	28,384	15,380	31,966	75,729	1,601,754,533
2028	30,596	15,658	36,192	82,446	1,743,805,174
2029	32,717	15,658	39,458	87,833	1,857,754,026

TABLE IV
TOTAL DEMAND ESTIMATION

Years	Total Subscriber Request
2020	761,436
2021	15,990,156
2022	20,347,262
2023	820,761,584
2024	1,072,877,963
2025	1,250,512,853
2026	1,369,174,990
2027	1,601,754,533
2028	1,743,805,174
2029	1,857,754,026

Service and Operational costs in this business are divided into 2 areas, namely CAPEX (Capital Expense) and OPEX (Operational Expense). CAPEX consists of costs for Telco Access Deployment, Telco Transport Deployment, Telco Core Deployment, Telco DC Deployment, and Telco IT Deployment. Meanwhile, OPEX consists of fixed and variable costs. The Fixed Cost consists of Service Fees, including HR and Marketing costs, Fiber optics, and BTS rental fees. Then, the Variable costs include the cost of the Domestic Internet Port, the International Internet Port, and the cost of making a SIM Card. Figure 5 shows a comparison chart between EBITDA earned and expenditures in CAPEX and OPEX.

Then, the OPEX (Operating Expenses) issued for this 5G investment will be explained. Table 5 shows Fixed Cost 1, which consists of Overhead Cost. These overhead costs consist of HR costs (basic salary, health benefits, and other bonuses), administrative and general affairs costs, and marketing and promotion costs. All scenarios have the same cost structure. Next is the Second Fixed Cost, as shown in Table 6.

TABLE V
FIXED COST I 2020-2029

Fixed Cost (1) Overhead Cost	**2020**	**2021**	**2022**	**2023**	**2024**
Number of Personnel	24	29	35	41	50
Personnel Expenses	$ 461,982.68	$ 615,360.92	$ 738,433.11	$ 886,119.73	$ 1,063,343.68
Other Personnel Expenses	$ 92,396.54	$ 123,072.18	$ 147,686.62	$ 177,223.95	$ 212,668.74
Total Personnel Expenses	$ 554,379.21	$ 738,433.11	$ 886,119.73	$ 1,063,343.68	$ 1,276,012.41
Admin & GA Expenses	$ 189,701.64	$ 247,256.59	$ 294,135.25	$ 350,132.36	$ 417,045.91
Marketing and Selling Expenses	$ 155,919.15	$ 171,511.07	$ 188,662.18	$ 207,528.39	$ 228,281.23
Total Fixed Cost (1)	**$ 900,000.00**	**$ 1,157,200.77**	**$ 1,368,917.15**	**$ 1,621,004.43**	**$ 1,921,339.55**
	2025	**2026**	**2027**	**2028**	**2029**
Number of Personnel	60	72	86	103	124
Personnel Expenses	$1,276,012.41	$ 1,531,214.89	$ 1,837,457.87	$ 2,204,949.45	$ 2,645,939.34
Other Personnel Expenses	$ 255,202.48	$ 306,242.98	$ 367,491.57	$ 440,989.89	$ 529,187.87
Total Personnel Expenses	$1,531,214.89	$ 1,837,457.87	$ 2,204,949.45	$ 2,645,939.34	$ 3,175,127.20
Admin & GA Expenses	$ 497,030.87	$ 592,670.41	$ 707,061.18	$ 843,915.78	$ 1,007,685.54
Marketing and Selling Expenses	$ 251,109.36	$ 276,220.29	$ 303,842.32	$ 334,226.55	$ 367,649.21
Total Fixed Cost (1)	**$2,279,355.12**	**$ 2,706,348.57**	**$ 3,215,852.95**	**$ 3,824,081.67**	**$ 4,550,461.95**

TABLE VI
FIXED COST II 2020-2029

Fixed Cost (2) BHP Frequency License	**2020**	**2021**	**2022**	**2023**
BHP	$ 111,208.27	$ 2,335,373.66	$ 2,971,732.09	$ 2,990,595.03
Telco Datacenter				
Deployment PoP per year	32	341	194	0
Deployment PoP accumulative	32	373	567	567
Point of Presence Rent Expenses (Colo)	$ 131,995.05	$ 1,538,567.30	$ 2,338,787.30	$ 2,338,787.30
Telco Access				
Number of 5G Pico Cell eNodeB BTS (accumulation)	0	0	0	18025

Fixed Cost (2) BHP Frequency License	2020	2021	2022	2023
Number 5G Micro Cell eNodeB BTS (accumulation)	0	0	0	8560
Number of 5G Macro Cell eNodeB BTS (accumulation)	36	756	962	12220
FO Backhaul Rent Cost per year	$ 89,096.66	$ 1,871,029.84	$ 2,380,860.72	$ 59,236,684.97
Tower 5G eNodeB Rent per year	$ 296,988.86	$ 6,236,766.12	$ 7,936,202.39	$ 143,928,181.86
Telco Office				
Deployment Headquarters Office	-	-	-	-
Number of Medium Office	1	7	6	-
Number of Small Office	3	4	3	11
Office Rent	$ 171,868.55	$ 790,595.35	$ 1,306,201.02	$ 1,306,201.02
Telco Transport				
FO Backbone km length	36	756	962	5,767
FO Backbone Rent Cost per year	$ 5,939.78	$ 311,838.31	$ 793,620.24	$ 4,757,802.83
Total Fixed Cost (2)	**$ 807,097.17**	**$ 13,084,170.58**	**$ 17,727,403.75**	**$ 214,558,253.00**
	2024	**2025**	**2026**	
BHP	$ 2,597,462.21	$ 3,196,294.02	$ 3,155,154.22	$ 2,597,462.2
Telco Datacenter				
Deployment PoP per year	0	0	0	0
Deployment PoP accummulative	567	567	567	567
Point of Presence Rent Expenses (Colo)	$ 2,338,787.30	$ 2,338,787.30	$ 2,338,787.30	$ 2,338,787.3
Telco Access				
Number of 5G Pico Cell eNodeB BTS (accumulation)	21308	23698	26016	21308
Number 5G Micro Cell eNodeB BTS (accumulation)	13223	14517	14887	13223
Number of 5G Macro Cell eNodeB BTS (accumulation)	16194	20908	23830	16194
FO Backhaul Rent Cost per year	$ 79,473,997.35	$ 95,247,294.53	$ 105,002,608.58	$ 79,473,997.3
Tower 5G eNodeB Rent per year	$ 194,808,506.05	$ 239,937,140.41	$ 267,179,509.91	$ 194,808,506.0
Telco Office				
Deployment Headquarters Office	-	-	-	-
Number of Medium Office	2	-	-	2
Number of Small Office	25	-	-	25
Office Rent	$ 1,306,201.02	$ 1,306,201.02	$ 1,306,201.02	$ 1,306,201.0
Telco Transport				
FO Backbone km length	5,767	5,767	5,767	5,767
FO Backbone Rent Cost per year	$ 4,757,802.83	$ 4,757,802.83	$ 4,757,802.83	$ 4,757,802.83
Total Fixed Cost (2)	**$ 285,282,756.75**	**$ 346,783,520.11**	**$ 383,740,063.86**	**$ 285,282,756.75**
	2027	**2028**	**2029**	
BHP	$ 3,155,154.22	$3,237,433.81	$ 3,278,573.61	
Telco Datacenter				
Deployment PoP per year	0	0	0	
Deployment PoP accummulative	567	567	567	
Point of Presence Rent Expenses (Colo)	$ 2,338,787.30	$ 2,338,787.30	$ 2,338,787.30	
Telco Access				
Number of 5G Pico Cell eNodeB BTS (accumulation)	28384	30596	32717	
Number 5G Micro Cell eNodeB BTS (accumulation)	15380	15658	15658	
Number of 5G Macro Cell eNodeB BTS (accumulation)	31966	36192	39458	
FO Backhaul Rent Cost per year	$ 127,903,990.66	$ 140,646,439.73	$ 150,480,701.96	
Tower 5G eNodeB Rent per year	$ 337,875,336.37	$ 375,480,366.69	$ 404,179,018.82	
Telco Office				
Deployment Headquarters Office	-	-	-	
Number of Medium Office	-	-	-	
Number of Small Offices	-	-	-	
Office Rent	$ 1,306,201.02	$ 1,306,201.02	$ 1,306,201.02	
Telco Transport				
FO Backbone km length	5,767	5,767	5,767	
FO Backbone Rent Cost per year	$ 4,757,802.83	$ 4,757,802.83	$ 4,757,802.83	
Total Fixed Cost (2)	**$ 477,337,272.39**	**$ 527,767,031.38**	**$ 566,341,085.54**	

The following are the company's sources of income in running a business as a 5G service provider. Revenue is obtained from Average Revenue Per Unit (ARPU) Mobile Data, Fixed Data, IoT Connectivity multiplied by Target Subscribers. Before moving on to revenue, the following explains how to get the target number of customers from Mobile Data and Fixed Data. In the first year, 36 BTS, or 50%, were built in areas that the Ministry of Communication and

Informatics has determined for the winning company related to BTS, which must be built for five years to provide services for the 5G network frequency license. Then, in the second year, area expansion of 36 points according to the Ministry of Communication and Information direction and network expansion so that all residents around 36 points in the first year can enjoy these services. Then, in the third year, the frequency range expanded to 36 points in the second year. Mobile and IoT networks will only be implemented in the fourth year because the license will move from ISR to IPSFR. Therefore, further regional expansion will be calculated according to the largest population with the largest internet user penetration in Indonesia with three types of services: Mobile Data, Fixed Data, and IoT Connectivity in as many as 17 cities each year.

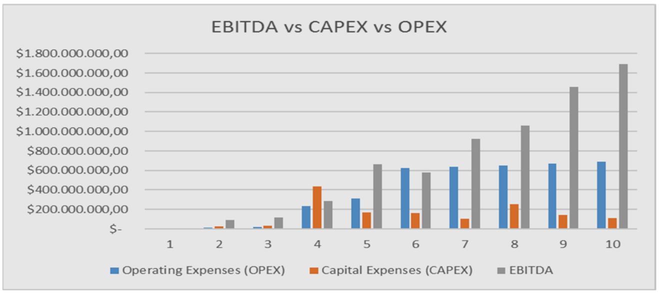

Fig. 5 CAPEX, OPEX, EBITDA

Total revenue can be seen in Table 7. Furthermore, the results of the calculation of profit and loss in the operation of 5G telecommunications network services are shown in Table 8.

TABLE VII
TOTAL REVENUE 2020-2029

Subscribers	**2020**	**2021**	**2022**	**2023**	**2024**
5G Target Subscribers (Mobile Data)	-		-	10,279,595	12,240,471
5G Target Subscribers (Fixed Data)	25,200	529,200.00	673,400.00	1,027,959.48	1,224,047.13
IoT Target Subscribers (Connectivity)	-	-	-	2,745,901	3,183,204
IoT Target Subscribers (Sensor Devices)					
Revenue Mobile Data	$-	$-	$-	$ 678,427,814.03	$ 807,840,809.95
Revenue Fixed Data	$ 6,236,766.12	$ 130,972,088.55	$ 166,660,250.24	$ 254,410,430.26	$ 302,940,303.73
Revenue IoT Connectivity	$-	$-	$-	$22,652,830.78	$26,260,447.34
Revenue IoT Sensors					
Collected Revenue	$6,236,766.12	$130,972,088.55	$166,660,250.24	$955,491,075.07	$ 1,137,041,561.02
	2025	**2026**	**2027**	**2028**	**2029**
5G Target Subscribers (Mobile Data)	14,653,247	17,974,826	21,221,513	24,498,222	26,952,527
5G Target Subscribers (Fixed Data)	1,465,324.68	1,797,482.64	2,122,151.34	2,449,822.20	2,695,252.66
IoT Target Subscribers (Connectivity)	3,624,028	4,154,254	4,677,698	5,201,704	5,642,183
IoT Target Subscribers (Sensor Devices)					
Revenue Mobile Data	$ 967,078,023.11	$ 1,186,294,057.95	$ 1,400,567,361.80	$ 1,616,822,022.29	$ 1,778,800,052.01
Revenue Fixed Data	$ 362,654,258.66	$ 444,860,271.73	$ 525,212,760.67	$ 606,308,258.36	$ 667,050,019.50
Revenue IoT Connectivity	$ 29,897,106.96	$ 34,271,312.31	$ 38,589,565.41	$ 42,912,449.04	$ 46,546,263.93
Revenue IoT Sensors					
Collected Revenue	**$ 1,359,629,388.73**	**$ 1,665,425,641.99**	**$ 1,964,369,687.88**	**$ 2,266,042,729.69**	**$ 2,492,396,335.44**

TABLE VIII
INCOME STATEMENT 2020-2029

Income Statement	**2020**	**2021**	**2022**	**2023**	**2024**
Collected Revenue	$ 6,236,766.12	$ 130,972,088.55	$ 166,660,250.24	$ 955,491,075.07	$ 1,137,041,561.02
Accumulated	$ 6,236,766.12	$ 137,208,854.67	$ 303,869,104.91	$ 1,259,360,179.98	$ 2,396,401,741.00
Revenue Shared	$ 1,871,029.84	$ 39,291,626.56	$ 49,998,075.07	$ 286,647,322.52	$ 341,112,468.31
Gross Revenue	$ 4,365,736.28	$ 91,680,461.98	$ 116,662,175.17	$ 668,843,752.55	$ 795,929,092.71
Accumulated	$ 4,365,736.28	$ 96,046,198.27	$ 212,708,373.44	$ 881,552,125.98	$ 1,677,481,218.70
Variable Cost (COGS)	$ 568,539.17	$ 293,424.16	$ 219,630.02	$ 8,812,145.61	$ 10,367,620.53
Net Revenue	$ 3,797,197.12	$ 91,387,037.82	$ 116,442,545.15	$ 660,031,606.94	$ 785,561,472.18
Fixed OPEX	$ 1,707,097.17	$ 14,241,371.35	$ 19,096,320.90	$ 216,179,257.43	$ 287,204,096.30
EBITDA	$ 2,090,099.95	$ 77,145,666.48	$ 97,346,224.25	$ 443,852,349.51	$ 498,357,375.88
Depreciation	$ 134,948.68	$ 2,535,773.58	$ 5,629,845.59	$ 48,907,429.64	$ 65,540,479.14
Other Cost (INCOME)					
EBIT	$ 1,955,151.27	$ 74,609,892.89	$ 91,716,378.66	$ 394,944,919.86	$ 432,816,896.73

Interest & HEDGING	$ 436,043.87	$ 579,478.53	$ 6,749,742.09	$ 8,927,151.51	$ 10,844,492.84
EBT	$ 1,519,107.40	$ 74,030,414.36	$ 84,966,636.57	$ 386,017,768.36	$ 421,972,403.89
(Income Tax)	$ 227,866.11	$ 11,104,562.15	$ 12,744,995.48	$ 57,902,665.25	$ 63,295,860.58
Net Income after Tax	$ 1,291,241.29	$ 62,925,852.21	$ 72,221,641.08	$ 328,115,103.10	$ 358,676,543.31
Retained Earning	$ 258,248.26	$ 12,585,170.44	$ 14,444,328.22	$ 65,623,020.62	$ 71,735,308.66
Dividend Shared	$ 77,474.48	$ 3,775,551.13	$ 4,333,298.46	$ 19,686,906.19	$ 21,520,592.60
	2025	**2026**	**2027**	**2028**	**2029**
Collected Revenue	$ 1,359,629,388.73	$ 1,665,425,641.99	$ 1,964,369,687.88	$ 2,266,042,729.69	$ 2,492,396,335.44
Accumulated	$ 3,756,031,129.73	$ 5,421,456,771.72	$ 7,385,826,459.61	$ 9,651,869,189.30	$ 12,144,265,524.74
Revenue Shared	$ 407,888,816.62	$ 499,627,692.60	$ 589,310,906.37	$ 679,812,818.91	$ 747,718,900.63
Gross Revenue	$ 951,740,572.11	$ 1,165,797,949.40	$ 1,375,058,781.52	$ 1,586,229,910.78	$ 1,744,677,434.81
Accumulated	$ 2,629,221,790.81	$ 3,795,019,740.21	$ 5,170,078,521.72	$ 6,756,308,432.51	$ 8,500,985,867.32
Variable Cost (COGS)	$ 12,420,219.48	$ 15,285,375.80	$ 17,953,494.74	$ 20,660,805.82	$ 22,572,454.88
Net Revenue	$ 939,320,352.63	$ 1,150,512,573.60	$ 1,357,105,286.78	$ 1,565,569,104.96	$ 1,722,104,979.93
Fixed OPEX	$ 349,062,875.23	$ 386,446,412.43	$ 480,553,125.34	$ 531,591,113.05	$ 570,891,547.50
EBITDA	$ 590,257,477.40	$ 764,066,161.17	$ 876,552,161.44	$ 1,033,977,991.91	$ 1,151,213,432.43
Depreciation	$ 81,685,999.53	$ 91,905,862.40	$ 114,830,840.46	$ 125,724,323.41	$ 136,757,497.51
Other Cost / (INCOME)					
EBIT	$ 508,571,477.87	$ 672,160,298.77	$ 761,721,320.98	$ 908,253,668.50	$ 1,014,455,934.92
Interest & HEDGING	$ 12,051,953.65	$ 14,955,198.60	$ 16,567,557.57	$ 17,803,920.07	$ -
EBT	$ 496,519,524.22	$ 657,205,100.17	$ 745,153,763.41	$ 890,449,748.43	$ 1,014,455,934.92
(Income Tax)	$ 74,477,928.63	$ 98,580,765.02	$ 111,773,064.51	$ 133,567,462.26	$ 152,168,390.24
Net Income after Tax	$ 422,041,595.59	$ 558,624,335.14	$ 633,380,698.90	$ 756,882,286.16	$ 862,287,544.69
Retained Earning	$ 84,408,319.12	$ 111,724,867.03	$ 126,676,139.78	$ 151,376,457.23	$ 172,457,508.94
Dividend Shared	$ 25,322,495.74	$ 33,517,460.11	$ 38,002,841.93	$ 45,412,937.17	$ 51,737,252.68

Figure 6 below shows that the Net Present Value for the business is $611,231,839.88 or Rp. 8,877,531,242,437.56. With the acquisition of this value, it can be said that it is feasible because of NPV > $ 0. Then, the Internal Rate of Return for this stand-alone 5 G service project business is 47.15%. With the acquisition of this percentage, it can be said that it is feasible because IRR> MARR (Minimum acceptable rate of return) is 12%. MARR is obtained from the assumption of an offer that can provide investment offers for investors with a percentage that exceeds the Investment Interest in the Bank.

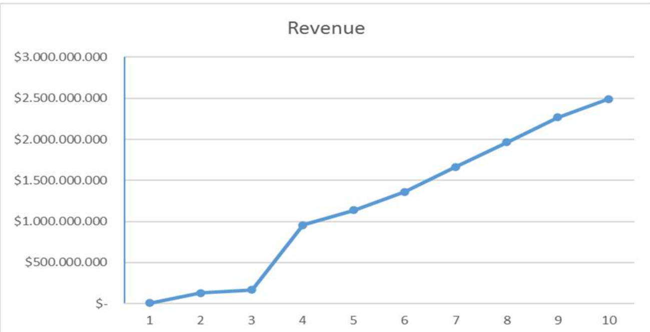

Fig. 6 Graph of Accumulated Revenue of 5G Mobile Data, 5G Fixed Data, and IoT Connectivity

The payback period for this business is 6.6 years or 79 months. This payback period is used to find out how long the project can return the residual value of the investment. With the acquisition of these numbers, it can be said that it is feasible because the Payback Period < n-Period Analysis (year of analysis) wherein this study was carried out ten years of business.

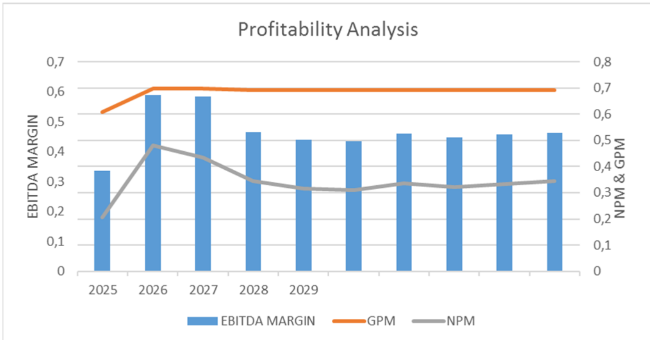

Fig. 7 Profitability Analysis

In Figure 7, it can be seen that the Gross Profit Margin has a stable trend because the assumptions made in this analysis are Variable Cost or COGS only SIM Card fees and Domestic International Internal costs, which tend to remain unchanged if there is no change in government or external regulations. Then, it can be seen that EBITDA Margin and NPM have a fluctuating trend that is different from GPM, which tends to be stable.

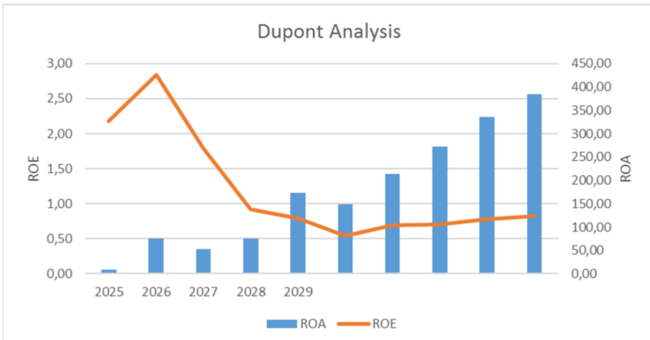

Fig. 8 Dupont Analysis

In Figure 8, it can be seen that the Return of Assets is always greater than the Return of Equity. This is because the equity this business owns is greater than its assets.

IV. CONCLUSION

Based on the results of the research, the conclusions obtained will answer the formulation of the problem and describe the research conducted in the form of an Analysis of the Implementation of 5G Telecommunication Services in Indonesia with a License Modality of 3.3 GHz Frequency and 12 MHz Bandwidth as follows: the results of the analysis according to the needs of the 5G service delivery project in Indonesia, which is obtained from the company's NPV of $611,231,839.88 or Rp. 8877,531,242,437.56. In addition, from the results of the calculations in the table above, the results of the company's IRR are 47.15%. Then, the results of the calculations in the table above show the results of the company's Payback Period of 6.6 years. The business is declared eligible to be held.

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