International Conference on Management of Technology, Innovation, and Project (MOTIP) 2020
July 25th 2020, Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia

IRR Incremental Analysis of Fuel Facility Construction Projects - Juanda Airport Terminal 2

Dimas Bagus Satriyo Wibowo[1] and Ervina Ahyudanari[2]
[1]Department of Technology Management, Institut Teknologi Sepuluh Nopember, Surabaya
[2]Departement of Civil Engineering, Institut Teknologi Sepuluh Nopember, Surabaya
e-mail: dimaswibowo.18092@mhs.its.ac.id

***Abstract*—Indonesia is the largest archipelago country in the world so that Indonesia's need for air transportation cannot be avoided. The demand for air transportation services increases in line with the increase in population and the level of welfare of the people. At Juanda Airport until the end of 2013 the number of passengers exceeds the capacity of the existing terminal. Overcoming this problem, PT Angkasa Pura I developed Terminal 2 of Juanda Airport, which began operating on 14 February 2014. With the development of facilities and flight facilities for Juanda Airport, aviation fuel supply needs have also increased. PT Pertamina (Persero) through the Aviation business unit as a provider of jet fuel at Juanda Airport, supports the development of the airport facilities. The investment carried out in 2017-2020 are the installation of a hydrant system pipeline for Terminal 2 and the addition of a storage tank to increase coverage days in the Depot Pengisian Pesawat Udara (DPPU) Juanda planned to begin in 2020. Until December 2019 the hydrant system project progress has reached 96%, but there has been a decline flight frequency since December 2018 due to partial closure of routes by airlines, reduction in flight frequencies and a decrease in jet fuel prices at market demand, so it is necessary to decide whether or not to continue investing in tank construction. Therefore, capital budgeting analysis is carried out using the incremental Internal Rate of Return (IRR) method between hydrant project investments and tank construction compared to hydrant projects without tank construction. The results of the incremental IRR analysis showed an IRR of 9.81% while the MARR used was 10.38%.**

***Keywords*—Airport, Capital Budgeting, Jet Fuel.**

I. INTRODUCTION

INCREASING the number of flights to and from Juanda Airport where in 2013 the number of passengers exceeds the capacity of the existing terminal. To overcome this, PT Angkasa Pura I developed Terminal 2 of Juanda Airport in terms of flight facilities which began operating on February 14, 2014. With the development of facilities for Juanda Airport, jet fuel supply needs will also tend to increase.

In line with the development of Juanda Airport Terminal 2, PT Pertamina (Persero) as a state-owned energy company through the Aviation business unit as a provider of jet fuel at Juanda Airport, supports the development of airport facilities. The investment carried out in 2017-2020 is the installation of a hydrant system pipeline for Terminal 2 and the addition of a storage tank to increase stock coverage days in the DPPU Juanda planned to begin in 2020. The sales trend for the 2013-2018 DPPU Juanda continues to increase. This condition requires additional storage to increase the security of stock in DPPU Juanda. In addition, in accordance with the Juanda Airport development masterplan, it is planned that additional investment in the 4 x 2500 KL tank is to complete the facilities to supply jet fuel to Terminal 2

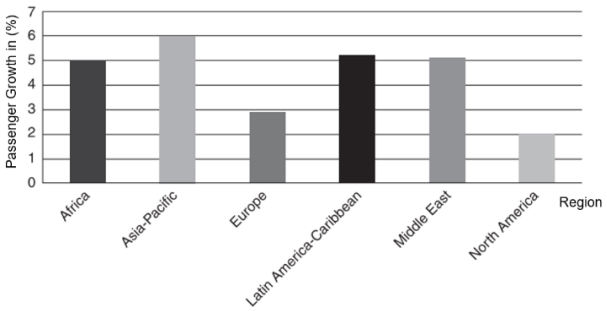

Figure 1. Estimated annual passenger growth to 2031 in percent.

The hydrant system pipeline project was carried out by PT JGC Indonesia as the main contractor. The work period is 51 months (Baseline start 01 March 2016 to finish 30 June 2020. The scope of this work consists of Engineering, Procurement and Construction (EPC) activity for Hydrant System Development and Topping Up in DPPU Juanda Terminal 2.

As of 10th of December, 2019 the progress of the hydrant pipeline project progress had reached 96%. However, when the project is on progress and is nearing completion there has been a decrease in the frequency of flights since December 2018 due to the partial closure of routes by airlines, a reduction in flight frequencies and a decrease in jet fuel prices at market demand.

One of the articles reported that Novie Riyanto as the Managing Director of the Indonesian Aviation Navigation Service Provider or Airnav Indonesia said that there had been a 15% reduction in flight frequency from December 2018 until the news was published (May 2019). One contributing factor is that it is suspected that certain routes have been facilitated by current land modes, such as Jakarta-Surabaya, Jakarta-Semarang, and Jakarta-Denpasar. The decline in passengers was also perceived by PT Angkasa Pura I. The airport management State Owned Enterprise (SOE) lost 3.5 million passengers in the first quarter of 2019 [1]. Meanwhile, from the annual sales report of the DPPU Juanda, compared to 2018 sales volume decreased by 9%. In addition to the number of refueled planes at Juanda Airport in 2019 has decreased by 19% compared to 2018.

All of these things have an impact on the income of the DPPU Juanda and the projected return on investment. Whereas in the middle of 2020 it is planned to continue with the addition of 4 x 2500 KL storage tank investment to equip facilities to supply jet fuel to Terminal 2 which also requires a large cost.

From the explanation above, research is needed to to estimate jet fuel sales volume, prices and cost as analytical

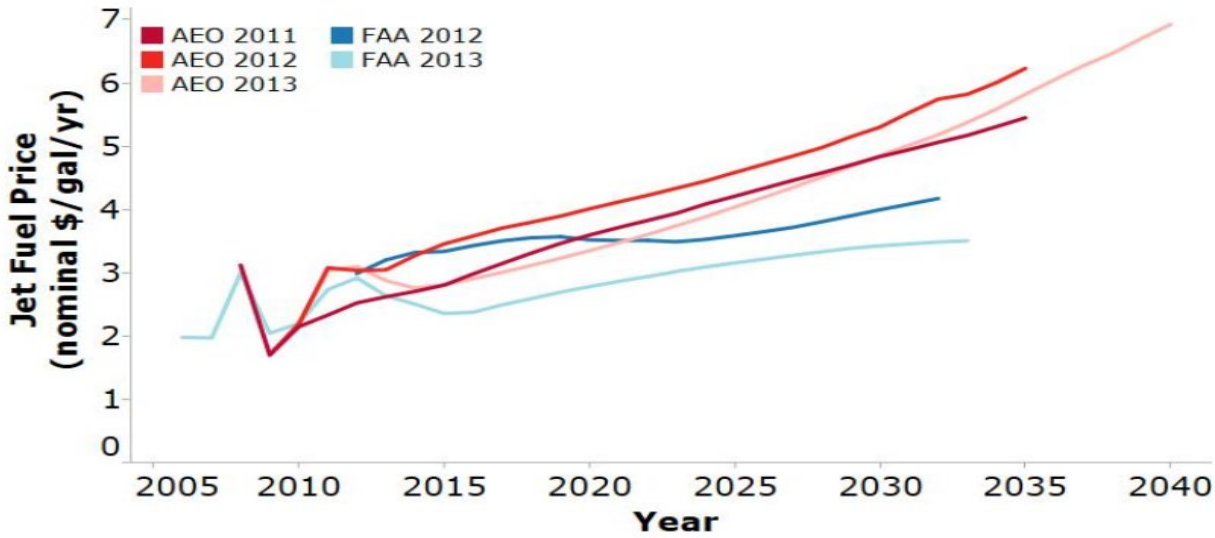

Figure 2. Comparison of projections for jet fuel prices from the Federal Aviation Administration (FAA) and Annual Energy Outlook (AEO).

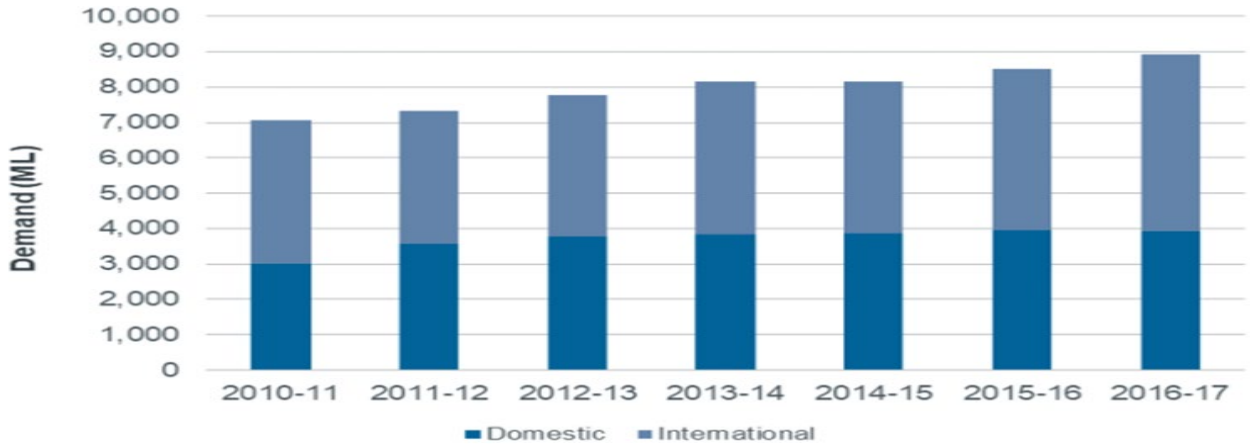

Figure 3. Demand for Avtur, domestic and international flights in Australia in million liters.

material to determine the limits of investment acceptance and give consideration to the decision on alternatives investment plans for the construction of jet fuel 4 x 2500 KL tanks which will be carried out in mid 2020. This study is used the alternative chosen using IRR incremental.

A. Airport Investment Project

The number of passengers grew by an average of more than 4.2% per year during the period 2004-2014 with the highest growth rates experienced in the Middle East and Asia. The Airport Council International (ACI) forecast shows that by 2031 around three quarters of passengers will be at airports in developing countries rather than developed markets and the Asia-Pacific region will cover more than 40% of traffic. Figure 1 shows that the largest annual growth rates expected are for Asia, the Middle East and Latin America. The same situation was predicted by Boeing and other estimates [2].

As a result of this growth and estimated traffic level, there is a lot of pressure on the airport industry to increase its capacity and invest in new infrastructure. In January 2015 there were more than 2,300 airport construction projects (expansion or new projects) identified throughout the world. In July 2015 an estimated 340 airport construction projects were new airports with 178 in the Asia-Pacific region. Fifty-four of them are in China, 39 in India and 30 in Indonesia [2].

Global growth in the value of airport investments worldwide is expected to continue to grow by 2.6% per year until 2025. Asia is the region with the largest growth. Indonesia in particular, a country where airport infrastructure spending has increased rapidly in recent years, requires an investment of up to 25 billion US dollars in the following decade [3].

From several studies related to airport investment, it can be concluded that until 2031 it is predicted that aviation traffic will continue to grow by up to 6% in the Asia Pacific region. This condition forced the airport industry to increase its capacity by investing both in developing existing airports and building new airports. From different country backgrounds, there are various kinds in airport investment financing. In Indonesia, airport investment is financed by the state through several related SOE. It is estimated that investment needs in Indonesia amount to USD 25 billion. The value of this investment exceeds the ability of Angkasa Pura I and II as SOE designated as airport operators. Different from other countries, for jet fuel infrastructure at Indonesian airports, investment is managed by another relevant SOE, Pertamina.

Table 1.
Fuel oil sales / consumption 2012-2016 in Indonesia (million liter)

Year	2012	2013	2014	2015	2016
Jet Fuel Consumption	3,899	4,159	4,229	67,510	66,939

Table 2.
DPPU juanda terminal 2 sales volume 2009-2019

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sales Volume (million liter)	38.1	38.5	40.9	47.3	48.9	49.9	51.8	53.7	56.9	59.5	53.9

Table 3.
Cost of DPPU Juanda Terminal 2 2009-2019 billion (IDR)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Cost	208.6	230.2	318.1	399.9	449.7	492.3	348.4	295.6	366.9	507.9	434.0

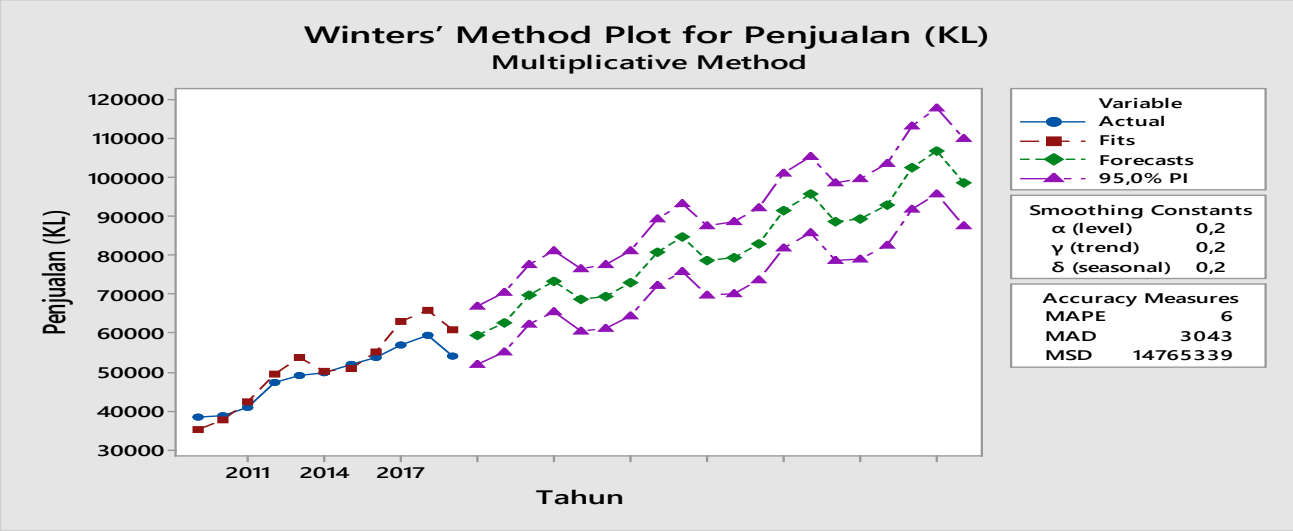

Figure 4. Sales volume 2009-2019 data plot and projection 2020-2039.

B. Jet Fuel Infrastructure at the Airport

At some large commercial airports, fuel can be transported to the air side (apron) through underground pipes and piped through a hydrant system. Another alternative to refueling aircraft is to transport fuel to the parked aircraft using refueling trucks. Fuel is filtered before it is delivered to a hydrant system or into a refueling truck, and the final filtration is carried out when the fuel is delivered to the aircraft fuel tank through filters in the refueling vehicle either through a hydrant or refueling truck.

Before the 1980s, the distribution and storage of fuel at major airports was handled by large oil companies which carried out with their own distribution systems. In the mid 1980s, many airlines formed a consortium to look for more competitive options. New joint ventures buy oil company distribution systems at several airports, manage infrastructure and fuel operations [4].

Airlines usually choose their fuel source through contracts with fuel suppliers who deliver fuel to airport fuel depots. At major hub airports, airlines buy fuel by a separate tender from more than one supplier, this is done to reduce risks arising from supply disruptions (eg natural disasters and fuel infrastructure problems). In general, the duration of the contract is 1-2 years and is binding for the delivery location, volume, and price [5].

The airline also invests heavily in supply chain partners for fuel supply (usually through airline and airport fueling consortium), for ground handling services, for customer service at airports, for catering and for other services [6].

From the literature study related to jet fuel infrastructure at the airport, it was found there are differences in infrastructure management in Indonesia and other countries. In Indonesia, infrastructure is the same as what happened in other countries before 1980, namely jet fuel managed by oil companies. Currently in other countries using a consortium between airlines, airport operators and oil companies. This causes differences in the way of valuing investments in terms of capital and operational expenditure as well as the income earned.

C. Jet Fuel Price

Jet fuel prices are higher than crude oil prices and are generally correlated with crude oil price trends. Short-term fluctuations in jet fuel prices are highly correlated with movements in heating oil and diesel prices. As a result, when the price of heating oil rises, the price of jet fuel rises. Jet fuel prices are projected to continue to increase over the coming decades as shown in Figure 2. From the data collected in this

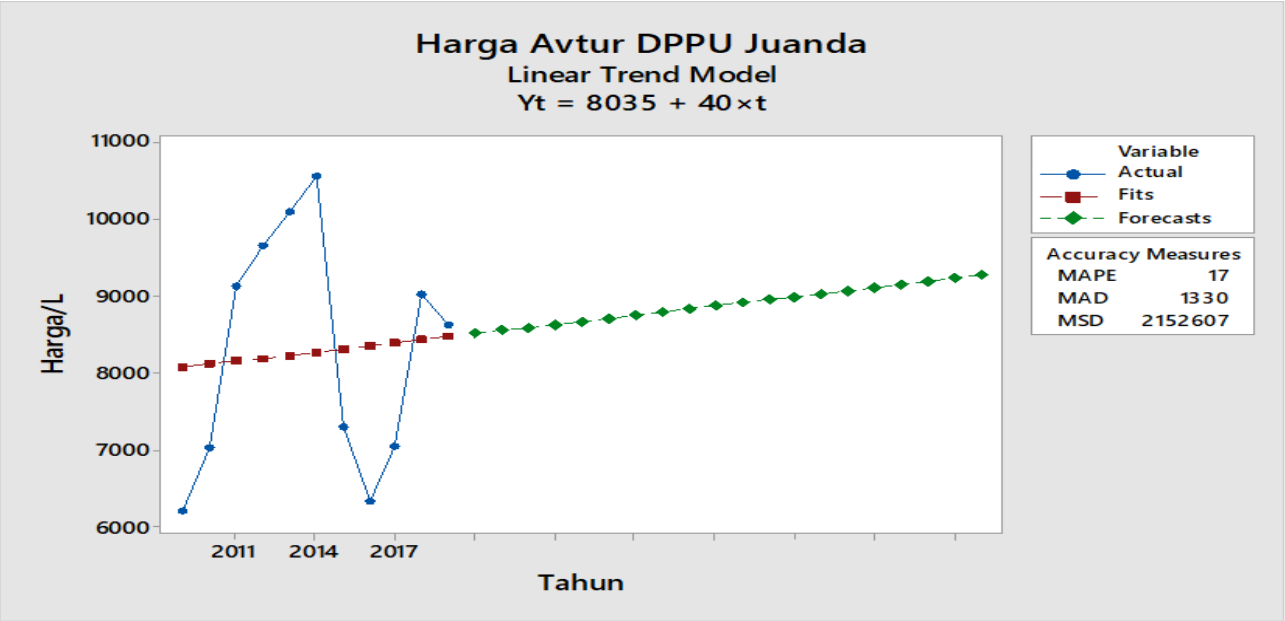

Figure 5. Jet fuel price 2009-2019 data plot and projection 2020-2039.

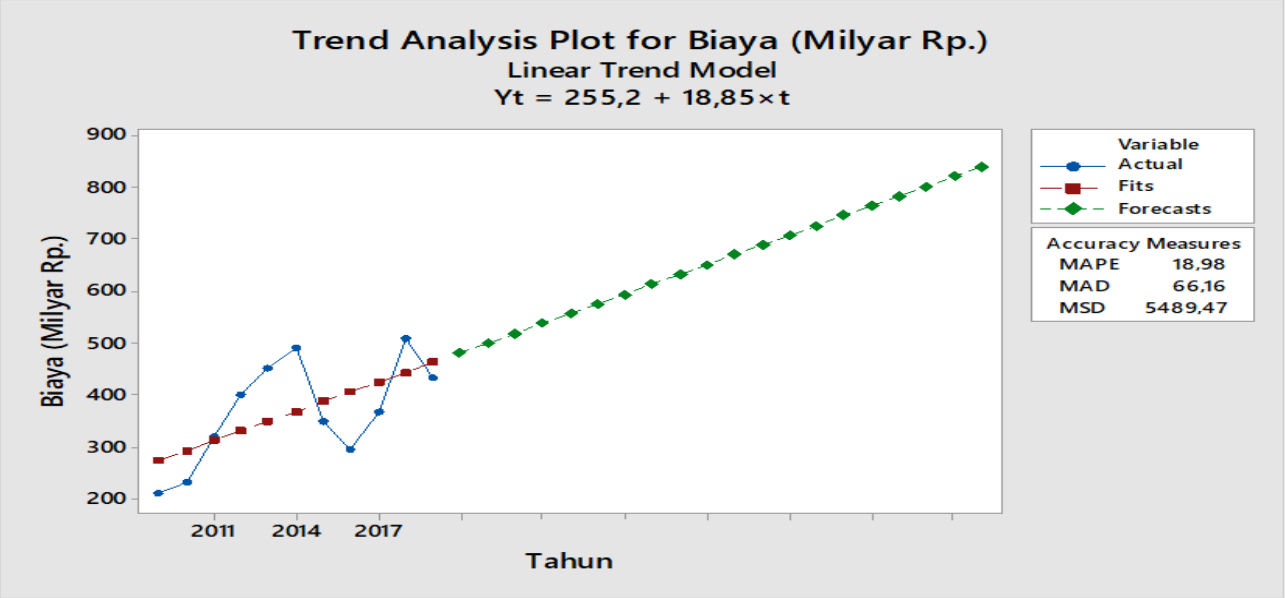

Figure 6. Cost DPPU Juanda 2009-2019 data plot and projection 2020-2039.

study, FAA (2013) does not project large increases but AEO (2013a) projects the price of Jet fuel nominal material to rise three times until 2040 [7].

Overall, jet fuel prices are determined by market prices, terms of the purchase contract, and location of purchase. Other determinants include outside influences, such as refinery closure, sudden changes and seasonal shifts in demand, supply disruptions (eg natural disasters) and market speculation and environmental regulations [8].

Bacon and Kojima conducted a statistical analysis to explore whether average prices remained constant over time and to test variants of crude oil and specific oil products over different periods using daily, weekly and monthly price indices. While jet fuel price patterns are found to be closely correlated with prices of other petroleum products, jet fuel prices are found to be slightly more volatile than gasoline prices but more volatile than prices of heating oil and diesel [9].

As a conclusion of the related literature review, several factors can influence the price of jet fuel. The same condition also occurs in Indonesia. The condition of domestic refineries that cannot meet jet fuel supply will cause jet fuel prices to increase because of imported supplies. Political instability also greatly affected domestic jet fuel prices. From market conditions such as during the holidays and the end of the year as well as market speculation greatly impacted jet fuel prices in Indonesia.

Indonesia itself through Pertamina, jet fuel prices are evaluated every two weeks. The price list is posted on Pertamina's official website. Indonesia's geographical conditions also affect domestic jet fuel prices. That is why jet fuel prices in Indonesia vary from airport.

Table 4.
Incremental cash flow in billion IDR

Year	0	1	2	3	4	5	6	7	8	9
Inflow		7.8	8.3	9.4	9.9	9.2	9.4	9.9	11.2	11.8
Outflow	62.4	3.1	3.1	3.2	3.2	3.1	3.3	3.1	3.2	4.0
Nett Cashflow	-62.4	4.7	5.2	6.2	6.8	6.1	6.1	6.8	7.9	7.8
Year		11	12	13	14	15	16	17	18	19
Inflow		11.0	11.6	12.9	13.7	12.6	12.7	13.3	14.8	15.6
Outflow		3.2	3.3	3.1	3.2	3.2	3.1	3.2	4.1	3.1
Nett Cashflow		7.8	8.3	9.9	10.5	9.3	9.5	10.1	10.7	12.4
IRR (incremental)		9,81%								
NPV with hurdle rate 10,38%		-2.5								

D. Jet Fuel Demand

Jet fuel demand in Australia by domestic and international flights has increased from around seven million liters in 2010-2011 to nearly nine million liters in 2016-2017 shown in Figure 3. This growth occurred because the annual increase in flights outweighed the continuous increase in aircraft average fuel efficiency. This also reflects the continued growth in international aviation, which on average increases more fuel per flight [10].

Whereas in the United States historically, the aviation industry has been jet fuel's biggest consumer with domestic and commercial flights accounting for more than half of consumption. From data compiled by the Research and Innovative Technology Administration and Defense Logistics Agency during 2000-2011, jet fuel consumption for military and domestic flights has decreased by around 18%, but consumption for international flights has increased by around 28% [7].

In another recent study explaining that commercial airlines in the United States consumed around 24.6 million gallons of Jet fuel in 2016. While worldwide demand is expected to increase by an average of 4.9% per year until 2030 [11].

From some of the research data outlined in this section, there is a similarity between Jet fuel consumption in Australia and the United States. Both show an increase of more than 20% on Jet fuel consumption for international flights. For Indonesia, jet fuel consumption is shown in Table 1. But not elaborated in detail Jet fuel consumption for domestic, international and military flights.

E. Forecasting

Forecasting is collecting data in the past which is then used for the purposes of estimating future data. Forecasting is the most important part for every company or business organization in every management decision making. Forecasting itself can be the basis for short-term, medium-term and long-term planning of a company. Thus, forecasting can be an estimate of future demand based on several variables, often based on historical time series data.

Forecasting the sales volume and price of a product in the future and its parts is very important in investment planning. Forecasting needs to be planned and scheduled to estimate what will happen in the future. In general, the definition of forecasting is interpretation. But by using certain methods, forecasting is not just an interpretation.

Forecasting methods for crude oil prices can be divided into three main categories namely time series, Autoregressive Integrated Moving Average (ARIMA), and artificial intelligence or machine learning models [13]. According to Hautington traditional time series models such as Simple Exponential Smoothing and Moving Average are the most common forecasting methods used for time series data, including the price of crude oil [14].

In the United States the relationship between demand and fuel prices is projected into the future using linear regression and estimation of univariate time series. The estimated percentage is then applied to the EIA Central Atlantic regional forecasts to get the New York forecast for 20 years. Regression analysis and univariate time series methodology were used. Regression analysis models produce more dynamic forecast ratios from New York to the Middle Atlantic, but in cases where historical trends is fluctuating and history is confirmed not to be an accurate future projection, time series models are used. The time series model is preferred in this case because the weight of the last few years is heavier than last year [15].

F. Capital Budgeting

1) Net Present Value (NPV)

This method is based on the discounted cash flow method (DCF). This method is the present value of each cash flow including cash inflows and outflows, discounted at the project cost level, with the following formulation [16]:

$$NPV = \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} - CF_0$$

Where NPV is Net Present Value; C_t is Cash Flow project; CF_0 is Initial Investment project; r is Discount rate of project.

Investment project criteria can be accepted if the NPV is more than 0 (NPV> 0) and the project will be rejected if the NPV is less than 0 (NPV <0) [17]. There are 2 (two) basic properties of Net Present Value; (1) Using cash flow, this cash flow can be used for other purposes such as dividend payments, other project capital budgeting or to pay interest on loans. (2) By using all cash flows from a project, another approach ignores cash flows between certain times. Inhibiting cash flow appropriately, another approach ignores the time value of money [17].

The advantage of using the NPV method is to take into account the time value of money, taking into account all expected cash flows from potential investments regardless of

the time of cash flow and this model allows comparisons to be made between projects with different cash flow patterns using the same predetermined discount rate.

The disadvantage of this method is that the model provides an error of accuracy, the calculation of present value is based on the uncertainty of future cash flows, the accuracy of financial calculations can produce quality and time factors without taking into account many factors, and the assumption of selecting discount rates is not easy for some individuals.

2) Internal Rate of Return (IRR)

IRR is the discount rate that makes the expected present value of future cash flows from the project equal to zero, or in other words, the discount rate that causes the Adjusted Present Value (APV) to be equal to Zero [17], which is formulated as follows:

$$CF_0 = \sum_{t=1}^{n} \frac{CF_t}{(1 + IRR)^t}$$

Where IRR is Internal Rate of Return; CF_t is Cash Flow Project; CF_0 is Initial Investment. Criteria for project investment are acceptable if the IRR is greater than the discount rate and will be rejected if the IRR is less than the discount rate [17]. The advantage of using the IRR method is to take into account the time value of money, taking into account all expected cash flows on investment potential regardless of the time of cash flow, this model allows the level of comparison made between projects with various cash flow patterns.

The disadvantage of using the IRR method is that the model provides an error of accuracy, the calculation of present value is based on the uncertainty of future cash flows, the accuracy of financial calculations can produce a quantity and time factor without taking into account the model can cause double IRR in terms of negative current cash over the life of the project and the model assumes that cash inflows can be reinvested in the project IRR, this assumption is not realistic.

3) Incremental Internal Rate of Return

Incremental IRR analysis is the next step of IRR analysis if the number of alternatives available is not single and we need to determine the ranking / priority of alternatives. The concept of an incremental IRR concept is to compare each alternative with other alternatives so that the best alternative will really be obtained.

II. METHOD

The purpose of this research is to obtain projected sales volumes, jet fuel prices and operational costs, as well as to consider investment plan decisions so that they can continue to benefit the company. Therefore we need several methods that are tailored to each stage of research. This study uses a financial model to look for investment decisions and capital budgeting criteria. This model outlines the long-term planning to carry out and finance the expenses of projects or programs that affect financial results for more than a year. Capital budgeting problems affect investment decisions because of the large financial aspects at stake and unclear developments in the future.

A. Data Collection

The data used in this research are secondary data. The data was taken through company documents. Company documents can be in the form of annual reports, Pertamina project investment data, and are supported by other resources from the internet.

The analysis focuses on project investment in the DPPU to support fuel marketing strategies for companies, and to make better estimates therefore this study uses data since 11 years ago. Data analyzed are time series data sourced from company operational data.

B. Data Analysis

This study uses several methods of analysis of capital budgeting analysis using Incremental Internal Rate of Return (IRR) and Net Present Value (NPV). This research was designed in several steps; The first step starts with carrying out the relevant basic estimates. This estimate is in the form of costs related to jet fuel sales volume, jet fuel price, cost and all matters related to the project.

Furthermore, the cash flow projection uses the data and estimates obtained, and performs capital budgeting analysis to compare two alternative investment choices and make decisions related to investment in the Construction of the Storage Tank in 2020 by using an incremental IRR. Then proceed with NPV to see the project from the financial aspect. The variables used in this research are sales volume, price and costs, which is directly affecting the income received by the compan.

III. RESULTS AND DISCUSSION

A. Costs and Investment Period

Investment / capital expenditure costs are the initial investment that will be spent by the company to fund projects for the development of the DPPU Juanda. This fund will be used for all materials and services in preliminary work such as licensing and any work in building facilities for processes, mechanical equipment, electricity, piping, instrumentation, civil, and until testing & commissioning before the project submission is carried out. The amount of work is calculated by Pertamina Engineering Services. Whereas for the planned investment of 4x2500KL storage tank, DPPU Juanda required capital is IDR 62,398 million and is executed proportionally.

The investment period in this study uses the economic life of the fuel pipeline and the storage tank. In general, the economic life of a piece of equipment is determined by the manufacturer. However, the economic age can also be determined in the work plan and requirements (terms of references) when the testing process by the user / Aviation Business Unit is tailored to the needs.

In accordance with the Decree of the Finance Director of PT Pertamina (Persero) concerning Determination of the Useful Life of Fixed Assets for Commercial and Taxation Accounting Purposes, types of Storage & Handling Facilities (Pipeline) assets and Piping Systems (Pipes) have a useful life

of 20 years. So that the two types of facilities and facilities that are being built and planned to be built in DPPU Juanda must be calculated well in terms of economic value in accordance with the decree in the framework of preparing a reasonable financial report.

B. Sales Volume of DPPU Juanda and its Projection

It was reported on the website of PT Angkasa Pura I (Persero) (2014) that the new Terminal of Juanda International Airport, Surabaya, namely Terminal 2 (T2), officially operates starting Friday, February 14, 2014. At this terminal, airlines served by Pertamina include Garuda, Air Asia and all international airlines in Juanda Airport.

In this study, the sales volume data collected is the jet fuel sales volume in terminal 2. Since terminal 2 only began operating in 2014, then to obtain data from previous years accumulated from jet fuel sales volume to each of the airlines mentioned above. Following are the data on the sales volume of DPPU Juanda terminal 2 in 2009-2019 (Table 2).

From the sales data collected, the plot is obtained as shown in Figure 4. From the sales data plot above, there is a tendency for the data to have repetition in 2012 and in 2018. Therefore, forecasting methods will be used that can accommodate seasonal historical data.

Many industry time series data show seasonal behavior, such as demand for clothing or toys and so on. As a result, the problem of seasonal forecasting is very important [18]. In this study, the analysis of seasonal time series data using Winters' exponential smoothing. The reason for using the Winters' method is because the method can handle seasonal factors and trends that appear simultaneously in a time series data.

C. Jet Fuel Price of DPPU Juanda

At present, jet fuel prices in Indonesia consist of the following two schemes: (1) Retail Price / Posted Airfield Price (PAP): The selling price of BBMP in each DPPU location and published on the Pertamina website. (2) Contract Price: The BBMP price is in accordance with the B2B agreement scheme between Pertamina and the airline and is very confidential.

Since 2009, the two jet fuel pricing schemes above have been used. The data collected in this study is the average of the two prices. Following are the data of jet fuel price per liter of DPPU Juanda in 2009-2019. From the results of the price data plot there is a match of the data with the projected charts made by the Federal Aviation Administration (FAA) in 2013 as shown in Figure 2. From this data a regression line is drawn and has a linear upward trend. Therefore, in the projection later, forecasting methods will be used that can accommodate data with linear trends.

Jet fuel prices tend to be easy to change, seen from the data that has increased and decreased each year. It can be concluded that the price of jet fuel is very difficult to predict the increase in the future and has no pattern. The data plots in Figure 5 in the period 2009 to 2019 have fluctuating values all the time but are in a straight line along the time axis.

From Figure 5, it can be concluded that jet fuel price data does not have a seasonal element because there is no high spike in any given period. However, from the drawn regression lines it can be seen that basically the price of jet fuel has increased from year to year. Therefore, projection can be done using the trend analysis method.

The use of trend analysis methods to predict jet fuel prices has previously been used by the International Energy Agency (IEA). Historical data on aviation fuel prices are collected and plotted. Historically jet fuel prices are described linear regression and then forecasted according to the trend [19].

D. Cost of DPPU Juanda

Costs used in cash flow will consist of COGS (Cost of Goods Sold) and Opex (Operational Expense). COGS is the total of all expenses and expenses that are imposed either indirectly or directly so that the product can be sold. While opex is a planned allocation in the budget to carry out normal company operations. In other words, opex is used to maintain the continuity of assets and ensure the planned activities of the company go well.

The amount of COGS depends on the price of the supplied jet fuel. DPPU Juanda jet fuel supply is obtained from domestic and imported refineries. To maintain the stability of costs incurred, the costs are limited by KPI. So as to simplify the forecasting in this study later, the cost is downloaded already in one cost component consisting of COGS added to Opex. Here is a summary of costs incurred by the DPPU Juanda in the past few years.

Cost data that has been collected, is obtained a plot as shown in Figure 6. From the plot of the cost data the regression line is drawn and has a linear upward tendency. Therefore, in forecasting later, forecasting methods will be used that can accommodate data with linear trends.

Seen from the data plot DPPU Juanda costs that increase and decrease each year. The rise and fall of costs is directly proportional to the price of jet fuel. The use of fees is limited by KPIs that increase each year so that future predictions have an upward trend. Similar to jet fuel prices, the data plots in Figure 4 in the period 2009 to 2019 have fluctuating values all the time but are in a straight line along the time axis. The similarity between the plot form of Jet fuel price data and the cost is similar.

From the description it can be concluded that the cost data does not have a seasonal element because there is no high spike in any given period. However, from the drawn regression lines it can be seen that basically costs also experience price increases from year to year. Therefore, forecasting can be done forecasting using the trend analysis method.

E. Depreciation

Every asset that will benefit the company has its own lifetime which will be depreciated periodically. Depreciation is basically a decrease in the value of a property or asset due to time and usage [20]. In this project, depreciation for the project will occur within 20 years, and the method used is a straight line, ie the total capex divided by 20.

The straight-line depreciation method is based on the assumption that the value of an asset is linearly proportional to the time or age from these assets. This method is quite widely used because the calculation is quite simple [20]. The depreciation value for the DPPU Juanda Storage Tanks 4 x 2500 KL Project will cost IDR 3.1 billion pa.

F. Salvage Value

Salvage value is the estimated value of an asset at the end of its depressed life. Residual value is usually the expenditure of the sale value of an asset with the costs needed to issue or move the asset [20]. As explained earlier, the investment period uses the economic life of the asset, which is 20 years used in this study. Depreciation used is the straight-line method. Therefore, the residual value calculation approach is zero.

G. MARR (Minimum Attractive Rate of Return)

MARR is the interest rate used as a basis for evaluating and comparing alternatives [20]. The determination of the MARR for the jet fuel Storage Tank Project at Juanda International Airport Terminal 2, considers the following: (1) Safe Rate originates from deposit rates at national banks. Interest rates are taken from several large banks in Indonesia and the average are 4.84%. (2) One of the determining factors is the hurdle rate. Hurdle rates are divided into five business groups namely upstream, midstream, downstream, other energy and non-energy. The DPPU Juanda project is classified as a downstream business group because it is seen from its activities that distribute jet fuel to end users. Based on the list of downstream business group hurdle rates refers to the approval of the company's board of directors with Rupiah currency so that the rate used is 10.38%. (3) The source of project financing in the DPPU Juanda comes entirely from equity without debt or loans, so debt and debt cost calculations are no longer needed.

Based on the three considerations above, the MARR of this study refers to point number two using the hurdle rate from Pertamina, which is 10.38%.

H. Incremental IRR Analysis

Jet Fuel Price of in the incremental IRR analysis that will be carried out in this study is to compare between the two project schemes. The alternatives scheme are: (1) Hydrant system development and topping up with additional 4x2500 KL storage tank. (2) Hydrant system development and topping up only.

The difference between the first scheme and the second scheme is the 4 x 2500 KL Storage Tank Construction project. Therefore, the incremental IRR is calculated from the investment value of the construction of the storage tank, the potential for an increase in the market and the costs.

The potential market increase with the implementation of the tank construction project is expected to be calculated using the approach of the number of aircraft movements in Juanda airport and compared to the number of aircraft carrying jet fuel in the same year. The approach used is the difference between the average normal growth and the average growth that should have been achieved by the DPPU Juanda. The percentage of growth difference that can still be achieved is 1.76%. From the existing data then made the difference cash flow from the first and second schemes. Then the incremental IRR is calculated and the results can be seen in Table 4. Inflow is calculated from the Market Increase Potential (KL) multiplied by the Price Projection. The result is the potential for increased sales.

While Outflow in the 0th year is a capex. Years 1 to 20 represent the operational costs of the new storage tank. This cost determined by the mandatory maintenance which occur during investment period out of cost projection in Table 3. Maintenance cost of storage tank consist of calibration, tank cleaning, certification and internal epoxy recoating.

From the results of incremental IRR analysis, IRR <MARR and NPV were negative. Therefore, the investment scheme that continues is investment with smaller capex, namely the second scheme, hydrant system development and topping up only.

IV. CONCLUSION

Conclusion from this research are: (1) Sales projections for the next 20 years forecasting the time series analysis of the Winters' method are presented in Figure 5. with an average sales volume growth from forecasting are 2.88%. (2) For the price of jet fuel, the projection for the next 20 years using time series forecasting, the trend analysis method is quite flat. The result only increases for 0.45%. (3) The forecast result of costs increase about 2.97% over a 20-year period. (4) Incremental IRR result were 9,81%, while MARR used 10,38%. This mean IRR <MARR. NPV for this incremental cashflow were IDR -2.5 Billion. (5) The second scheme of investment chosen which has less capex, is hydrant system development and topping up without storage tank construction.

REFERENCES

[1] I. S. Syarief, “Tiket Pesawat Mahal, Frekuensi Penerbangan Pun Turun Hingga 15 Persen,” 2019. [Online]. Available: https://ekonomibisnis.suarasurabaya.net/news/2019/220851-Tiket-Pesawat-Mahal,-Frekuensi-Penerbangan-Pun-Turun-Hingga-15-Persen.

[2] A. Graham and P. Morrell, *Airport finance and investment in the global economy*. 2016.

[3] H. Morphet and A. Copeland, “Converting emerging market growth into investment opportunities,” *Connectivity and growth Issues and challenges for airport investment*, pp. 16–19, 2015.

[4] R. Sturtz and G. Smith, “Fuel Consortia: A 30-Year Success Story,” *2010 Aviation Special Report*, pp. 10–11, 2010.

[5] B. Miller and J. Heimlich, “Guidance for Selling Alternative Fuels to Airlines,” 2013.

[6] M. W. Tretheway and K. Markhvida, “Airports in the Aviation Value Chain: Financing, Returns, Risk and Investment,” *Roundtable Expand. Airpt. Capacit. under Constraints Large Urban Areas*, pp. 1–27, 2013.

[7] C. Davidson, E. Newes, A. Schwab, and L. Vimmerstedt, “An Overview of Aviation Fuel Markets for Biofuels Stakeholders,” 2014.

[8] US Energy Information Administration (EIA), “Reductions in Northeast Refining Activity : Potential Implications for Petroleum Product Markets,” 2011.

[9] R. Bacon and M. Kojima, “Energy Sector Management Assistance Program Coping with Oil Price Volatility,” p. 160, 2008.

[10] Board of Airline Representatives of Australia, “Submission to the Productivity Commission - the competitive supply of jet fuel Overview of BARA,” no. September, 2018.

[11] H. Peter, K. Lewis, and F. Sara, “Refinery to Wing: Transportation Challenges Associated with Alternative Jet Fuel Distribution,” no. 4, pp. 1–6, 2017.

[12] BPH Migas, “Statistik Minyak dan Gas Bumi,” 2017.

[13] B. Behmiri, N. P. Manso, and J. Ramos, “Crude Oil Price Forecasting Techniques: A Comprehensive Review of Literature,” *SSRN Electron. J.*, pp. 1–32, 2013.

[14] X. J. He, “Crude Oil Prices Forecasting: Time Series vs. SVR Models,” *J. Int. Technol. Inf. Manag.*, vol. 27, no. 2, p. 25, 2018.

[15] Annual Energy Outlook (AEO) 2002, “All Fuels Demand and Price

Forecast Methodology," *Atlantic*, no. June, pp. 1–20, 2002.

[16] E. F. Brigham and J. F. Houston, *Fundamental of Financial Management 10th Edition*. 2003.

[17] S. A. Ross, R. W. Westerfield, and J. Jaffe, *Corporate Finance*, 10th ed. McGraw-Hill, 2013.

[18] P. Kalekar, "Time series forecasting using Holt-Winters exponential smoothing," *Kanwal Rekhi Sch. Inf. Technol.*, no. 04329008, pp. 1–13, 2004.

[19] H. R. te Raa, W. J. Ockels, J. A. Melkert, T. A. Snijders, and W. W. A. B. van Blokland, "Bio jet fuel from macro algae," no. April 2015, 2011.

[20] I. N. Pujawan, *Ekonomi Teknik*, 2nd ed. Surabaya: Guna Widya, 2009.