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Economic Assessment of Offshore Application of Floating Gas to Liquid Technology in the Niger Delta

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ABSTRACT

It is reported that natural gas now represents almost 60% of the contribution made by petroleum in terms of energy equivalence. This growth can be attributed to the environmental premium placed on natural gas since it is far less polluting than the main fossil fuels of coal and oil as well as the expansion witnessed in the economy. Major problems in utilizing natural gas worldwide have been predominantly the high transportation costs compared to crude oil. At the moment, there are a list of gas utilization options. However, converting stranded and marginal gas to liquid products other than LNG, has been receiving considerable attention in recent years. But not much has been done to determine the economic viability of the concepts. This study appraised the economic viability of offshore application of Floating Gas to Liquid Technology (FGTL) in the Niger Delta region of Nigeria in terms of plant capacity using Net Present Value (NPV), Internal Rate of Returns (IRR), and Discounted Payback Time (DPBT). The outcomes of the study showed that offshore gas to liquid processing is economically viable in the region as NPV of $1.3 Billion, $3.5Billion, $9.1Billion and $7.1Billion; Internal Rate of Return of 18%, 22%, 26% and 30% and Discounted Payback Time of 7 years, 9years, 12 years and 14 years were obtained for 10000BPD, 33000BPD, 60000BPD and 120000BPD capacity plants respectively at 15% Discount Rate and $60 per barrel product price. Sensitivity and Risk analysis were conducted using Model Risk and Oracle Crystal Ball respectively. The analysis showed that the Discount Rate, Product Price, and Plant Capacity affect the NPV the most. It also showed that the Discount Rate affects the NPV negatively while the plant capacity and the product price affect the NPV positively. NPV values for the cases considered at different discount rates ranges from $500 Million to $100 Billion. A 75% certainty level was obtained for achieving an NPV within this range, indicating a 25% associated risk.

Index Terms – Discounted Pay Back Time, Gas to Liquid, Internal Rate of Return, Net Present Value, Sensitivity Analysis, Risk Analysis.

1. INTRODUCTION

The Niger Delta Region according to literature is a gas province with oil pockets. These resources are dispersed across the offshore region in small to large deposits. About Sixty Percent of these resources are found in the offshore region. The condition of the marine environment vis-a-vis the properties of natural gas has necessitated the use of special container for the storage and transportation, making the development cost of these reserves to be expensive. A consequence of this is that most of these marine deposits are left undeveloped hence the name "*stranded reserves*". When these resources are produced, the cost of transportation using existing options to an onshore location for processing and sale rises as the distance from the shore and the depth of the water increases (Bassey, 2007). Environmental concerns over harmful emissions from combustion of fossil fuel have grown over time, necessitating research into cleaner fuel, this provided for more research into ways to utilize natural gas due to its clean nature (Adewale & Ogunride, 2010) since the economics of available technologies has impeded the development of most gas reserves despite its clean nature especially in the offshore region. Natural gas utilization requires developing a strategy for transforming natural gas from the production field into a variety of commercially viable solutions. Existing natural gas utilization options include: Enhanced Oil Recovery (EOR), converting natural Gas to Methanol (GTM), Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), and Gas to Liquid (GTL), Gas Hydrate and Gas to Wire (GTW) (Balogun & Onyekonwu, 2009). These options have similar limitation when applied to exploit offshore deposit. In order to overcome this limitation, new research and development as well as new technology is key in overcoming natural gas transportation and storage difficulty.

One of the probable ways to harness stranded natural gas resources is to convert it to liquid at the place of production. Applying the LNG technology will require a large natural gas deposit to be economical. The concern therefore will be to convert the produced gas into a form that can be transported using existing crude oil storage and transport infrastructure. This will not only increase gas field development in the marine environment, but it will also improve the investment's profitability. There have been a lot of interest in converting stranded and marginal gas to liquids other than LNG in recent years using floating GTL technology to reduce gas flaring and aid the exploitation of stranded reserves in the Niger Delta offshore region (Bassey, 2007). Also, there are calls for more researches into ways to utilize natural gas due to its clean nature (Wami, 2005; Adewale & Ogunrinde, 2010) since the economics of available technologies has impeded the development of most gas reserves, despite its clean nature especially in the offshore region.

This research therefore looks into assessing the economic viability of this new method for utilizing stranded gas in the offshore region of Niger Delta. The concept entails installing GTL technology on a floating platform, to bring the produced gas into a form where its properties are similar to conventional crude oil, thus, aiding their transportation via existing crude oil transport channels.

2. LITERATURE REVIEW

The oil industry is faced with the challenge of encountering natural gas when exploring for oil. This problem is specially the case of the Niger Delta region since it is a gas province with pockets of oil. But the draw back in Natural gas utilization is due to two major reasons, these are: low energy content per volume as well as storage and transportation difficulties. The later poses the largest cost-related challenge, and this has majorly impeded the development of offshore natural gas deposits. Several options are available for the monetizing of marine reserves; the Pipeline transportation has shown to be one of the most efficient methods of transporting gas; nevertheless, the cost of pipeline construction rises as the distance from the coastline and the depth of the ocean increases. Although LNG is a potential option, the cost of establishing a liquefaction and regasification facility necessitates a large natural gas deposit for this option to be economically viable. Other options face the same difficulties as the aforementioned

Technological advancement is expected to provide improved options for monetizing gas resources. Recently it is believed that natural gas can also be utilized by transforming them to a liquid state at the site of production before transporting them to their final destination. This has been the case with gas-to-liquid technological (Bassey, 2007).

Rivero & Nakagawa (2005) linked the recent increase in offshore oil and gas activities to the current trend in fuel source placement, which is toward far offshore areas, deeper water fields, and complex geological conditions. This tendency is currently being observed in Nigeria, where the majority of offshore deposits are gases. There's therefore a requirement for a viable means which can be applied economically to monetize these resources

Around 90% of Nigeria's found oil resources are thought to be gas-prone (Bassey, 2007). Although the LNG method appears to be a realistic option, the logistics of bringing LNG to a central location provides a challenge to the investment's profitability. This is due to the fact that offshore reserves are dispersed in smaller deposits throughout a large number of extremely fractured fields within the region (Agee, 2005). Nigeria's offshore gas reserves are either re-injected or flared annually at a rate of 8 billion standard cubic feet. This places the country as s sixth-largest flaring nation in the world.

Monetizing Nigeria’s offshore stranded gas economically, will requires a low cost solution. A viable means will be to convert the gas at point of production into high energy liquids using the three- stage Fischer Tropsch GTL process, comprising of synthetic gas generation, synthetic Crude generation and Product upgrade stages.

The synthetic gas (syngas) generation stage is a *reforming* stage. It involves the breaking down of hydrogen carbon molecules, stripping of hydrogen from it and introduction of oxygen in the form of steam, water or air. An ideal syngas has hydrogen to oxygen ratio of 2 (Al Saadoon, 2007). There are basically three types of reformers: Steam Methane Reformer (SMR). Partial Oxidation Reformer (POX) and Auto Thermal Reformer (ATR). The syncrude generation stage is a chemical process. It involves the use of Reactors to convert the syngas into syncrude. Al Saadoon (2007), listed Tubular fixed Bed Reactor, Fluidized Bed Reactor and Slurry Bubble Column Reactor; as the three types of reactors with which this can be done. The product upgrade stage involves the further treatment of the derived syncrude into their sales values or market need.

Energy International (EI), a leader in catalyst and process development as it relates to Fischer-Tropsch (F-T) technology developed a concept for a technique for capturing the fuel value in the associated natural gas contained in crude oil. In the concept, dissolved natural gas would be processed via F-T technology to produce light hydrocarbons that would then, in one manifestation of this concept, be re-dissolved in the crude oil to produce a lighter crude than the original containing all of the natural gas, but with the Vapour pressure of the crude lowered to an acceptable level via the conversion process (Singleton and Cooper, 1997).

This technique can be of particular interest in those instances where the alternative methods of collecting and utilizing the associated natural gas are expensive. A study of the application of this technology was undertaken by EI with support from the United States Department of Energy (US-DOE). EI asserted that an offshore F-T plant can best be accommodated by a FPSO (Floating Production, Storage, Off-loading vessel) based on a converted surplus tanker. The combination of an F-T plant with a FPSO was referred to as a FFTP (Floating Fischer-Tropsch Production system) by EI (Singleton and Cooper, 1997).

With a large portion of the world's natural gas deposited in the offshore region, the conversion of natural gas to synthesis fuels using the Fischer-Tropsch process to create high energy liquid fuels in offshore locations offers an alternative to flaring, re-injection, or LNG production (Gradassi, 1995; Jager 1998; Hutton, 2003; Bassey, 2007). The implementation of the FT method offshore is being closely examined due to growing environmental constraints in the developed countries. Specifically, the use of a Fischer-Tropsch unit aboard a ship/barge (Floating Production Storage and Offloading vessel) is a particularly innovative and productive means of converting flared gas into clean, synthetic petroleum.

Alternatively, for stranded gas reserves, the gas can be processed using the three step FT technology to produce high energy, low sulphur synthetic fuels. Producers could also earn valuable carbon credits by extinguishing flared gas. In the longer term, offshore FT-GTL plants could reduce costs even more and make the development of some small and remote gas reserves or deep offshore gas feasible. This technology has the potential to reduce cost by minimizing the costs of offshore platforms and pipelines, eliminating the need for port facilities and reducing the time needed to construct pipelines.

2.1. Challenges of Floating GTL

To successfully implement the floating FT-GTL facility within the Niger Delta region, the following challenges need to be considered:

1. The attendant logistic and technical complexities as well as safety considerations and security.

2. The thorough examination of the economic viability of such a venture.

According to Verghese (2003), the deployment of GTL equipment systems offshore and their marinization (moving to a marine environment) provide a number of obstacles, which includes:

i. System simplification: To lower the size of units, equipment and systems must be rigorously assessed.

ii. Marinization: The effects of salt carrying air on reactor systems and metallurgy (particularly under high pressure settings) must be assessed for gas conversion operations. In addition, the impact of motion on mechanical design and process performance necessitates a thorough examination.

iii. Process Control and Surveillance: The sophistication of process control and surveillance must be improved. Due to the relative difficulties of gas conversion methods, this is required.

iv. Process Conditions: High temperatures and pressures associated with gas conversion are another concern that requires careful consideration

v. Integration with Exploration and Production Operations: The system must be robustly constructed to manage more frequent shut downs and starts, as well as the flexibility to respond to variations in fluid flows and compositions.

vi. Constructability: One of the merits of FPSO deployment is the ability for equipment and systems integration to be carried out in ship yards. But the integration of such equipment (having their individual weight and size) can pose a challenge on safety.

3. ECONOMIC VIABILITY ASSESSMENT INDICES

Overview of the economic principles that can be used to assess the viability of Floating GTL investment in the Niger Delta requires basic understanding of definitions and mathematical derivatives of such economic tools which are applicable in this study, such as:

3.1 Net Present Value

This is the most theoretically applicable project appraisal tool due to its consideration of the time value of money. It is calculated by discounting the future value of an investment's cash flows (returns) and comparing it to the current value of the investment outlays (Payments). The NPV is the difference between the two (returns and payments). Mathematically, it can be defined as:

$$NPV = \sum_{t=1}^{n} \frac{C_n}{(1+i)^t} - (C_o - SV) \quad 1$$

Where

C_n = Expected net cash flow (USD)

C_o = Initial Investment (USD)

i = discount rate

n = Project Economic Life (years)

SV = Salvage Value (USD)

t = Time (years).

Mian (2010) suggested that Co be defined as "the present value of the capital outlays", since a capital project's capital outlay may span more than one period,

3.2 Internal Rate of Return (IRR)

Internal rate of return is the Discount Rate (DR) that equates the present value of expected net operating cash with the initial cash out flow. Simply put, it is the discount factor that gives an NPV of zero.

Mathematically, it is defined as:

$$ICO = \sum_{t=1}^{n} \frac{C_n}{(1+IRR)^t} \quad 2$$

Where

C_n = Expected net cash flow (USD)

ICO = initial Capital Outlay (USD).

IRR = Internal rate of return (discount factor)

n = number of useful life (years)

t = time (years)

3.3 Discounted Payback Time (DPBT)

The DPBT is the projected number of years it will take to recoup the initial investment (Mian 2010). It can alternatively be defined as the time it takes for the investment's discounted revenue to repay the initial capital. It simply provides an answer to one question: "How long does it take to recoup the initial investment?" When the term "project economic life" is used, it refers to whether the project repays its starting capital within the project's usable life. There are two techniques for calculating the payback period (Mian, 2010), viz:

(a) Accumulation of the negative NCF each year until it turns positive. The point between the negative and positive NCF is then interpolated to get the payback period, (b) Plotting a graph of the cumulative Net Cash Flow (NCF) against time, the payback period is read at the point where the cumulative NCF crosses the zero line. For this study, the second method was used

3.4 Power Law and Sizing Model

This is also known as the exponential rule or the six-tenth rule. It is a nonlinear correlation that's frequently used to estimate the cost of a new process facility based on the cost of an existing known capacity (Hendrix and Au, 2003; Kerzner, 2001). Below is the mathematical expression.

$$C_b = C_a \left\{\frac{Q_b}{Q_a}\right\}^m \quad 3$$

Where

C_a = Cost of existing facility

C_b = Estimated cost of new facility

Q_a = Capacity of existing facility.

Q_b = Estimated capacity of new facility.

m = correlation exponent, $0 < m < 1$.

For most equipment, m is approximately 0.5, and for chemical processing plant, it is approximately 0.6 (Mian, 2010).

The following assumptions were made for development of the SpreedSheet model

CAPEX (Base case)	$ 9.945 Billion
OPEX	5%
Cost of Product per barrel	$60
Discount Rate (DR)	10%
Income Tax	30%
Depreciation (15 years)	Straight Line Depreciation

3.5 Economic Model Development

An Economic model was developed using Microsoft Excel Spreadsheet. The Spreadsheet was programmed to perform the cash flow analysis using the above "assumption values" and output values for the three economic indicators used

The following equations were used to generate the spreadsheet model that was used to obtain values for the profit indicators.

Revenue = Product Price * Plant Capacity

OPEX = 5% of CAPEX

Net Working Capital (NWC) = Revenue – OPEX

Depreciation = CAPEX/ (number of useful life)

Taxable Income = NWC – Depreciation

Tax = 30% of Taxable Income

Net Income = Taxable Income – Tax

Discount Factor = $(1+DR)^{-n}$

Present Value = Net Income * Discount Factor

See appendix for spreadsheet model.

4. RESULTS AND DISCUSSION

The Net Present Value (NPV) obtained at different discount rates for the four plant sizes considered are shown in Table 1.

Discount Rate	NPV (10000BPD)	NPV (33000BDP)	NPV (60000BPD)	NPV (120000BPD)
3%	$ 104,475,134,084.57	$ 106,182,129,038.57	$ 108,697,554,069.81	$ 117,832,901,632.51
5%	$ 71,584,082,835.34	$ 71,854,565,227.37	$ 72,932,737,798.32	$ 78,738,542,981.99
7%	$ 50,035,605,242.64	$ 49,299,232,097.75	$ 49,370,030,535.06	$ 52,842,150,467.08

10%	$ 30,183,580,461.60	$ 28,433,992,488.20	$ 27,491,054,224.82	$ 28,614,749,367.57
15%	$ 13,753,698,363.27	$ 11,032,072,019.59	$ 9,116,594,722.34	$ 7,987,303,686.25
20%	$ 6,294,302,981.21	$ 3,033,458,859.42	$ 578,486,051.50	$ (1,800,601,534.42)
25%	$ 2,480,218,441.61	$ (1,114,913,980.80)	$ (3,904,347,269.77)	$ (7,058,246,780.89)
30%	$ 325,575,833.81	$ (3,494,814,768.05)	$ (6,509,622,259.23)	$ (10,185,624,169.29)
35%	$ (993,980,296.69)	$ (4,975,849,721.44)	$ (8,152,219,207.70)	$ (12,202,496,009.86)

Table 1: NPV Values for all Plant Sizes Considered at varied Discount Rate

The NPVs, were all positive at $60 per bbl crude oil price, and the 15% DR. This is an indication that the investment will be profitable in the region. The 15% DR is of interest because it is the World Bank recommended DR for oil and gas investment in Nigeria.

Figure 1 shows the Internal Rate of Return (IRR) obtained for the four cases considered. A 15% DR was assumed for the study, hence, IRR greater than 15% will indicate profitability of the investment in the region.

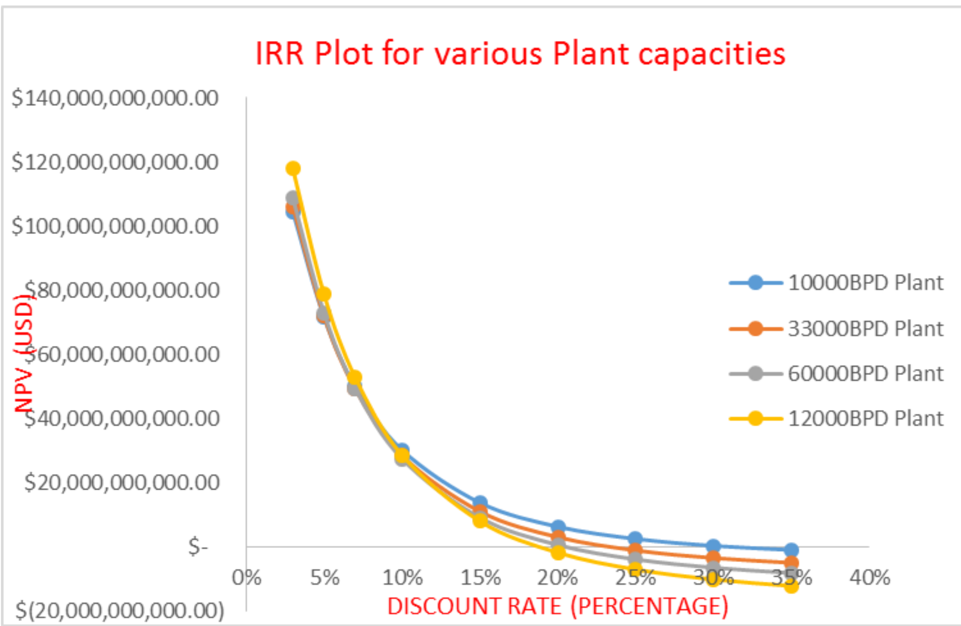

Figure 1: Plot Showing Internal Rate of Return (IRR) for all Plant sizes

The Obtained IRR are all greater than the DR The highest IRR of 35% was obtained for 10000 BPD Plant and the lowest IRR of 20% was obtained for the 120000 BPD Plant.

Figure 2 shows the Discounted Payback Time obtained for the cases considered for period up to 30 years, plant capacity useful life.

The obtained DPBT for all cases are all less than half the useful life of the facility, with the highest being 14 years for 120000 BPD plant and lowest being 5 years for 10000 BPD plant. This trend can be attributed to the fact that larger plant sizes require larger capital, and larger capital requires longer pay back time. This indicator is subject to the investor preference. The values obtained from the analysis indicate that the investment will pay back its initial investment cost in a times duration that is less than half the useful life of the project. This is also a pointer that the project will be profitable in the region.

Figure 3 and 4 represent results obtained from the Sensitivity and Risk Analysis conducted using Model Risk and Oracle Crystal ball respectively to ascertain which of the above listed assumption parameter affect the NPV of the investment the most and how it affects it and also to determine the likely NPV that can be obtained from offshore investment of floating GTL plant in the Niger Delta.

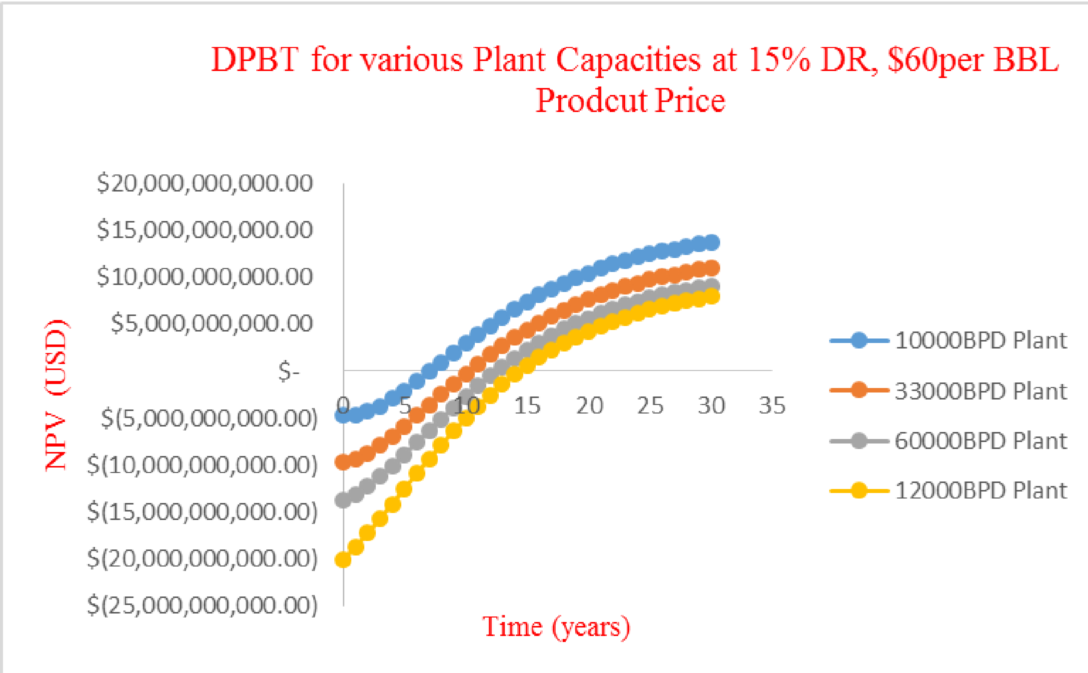

Figure 2: Plot Showing Discounted Payback Time for all plant sizes.

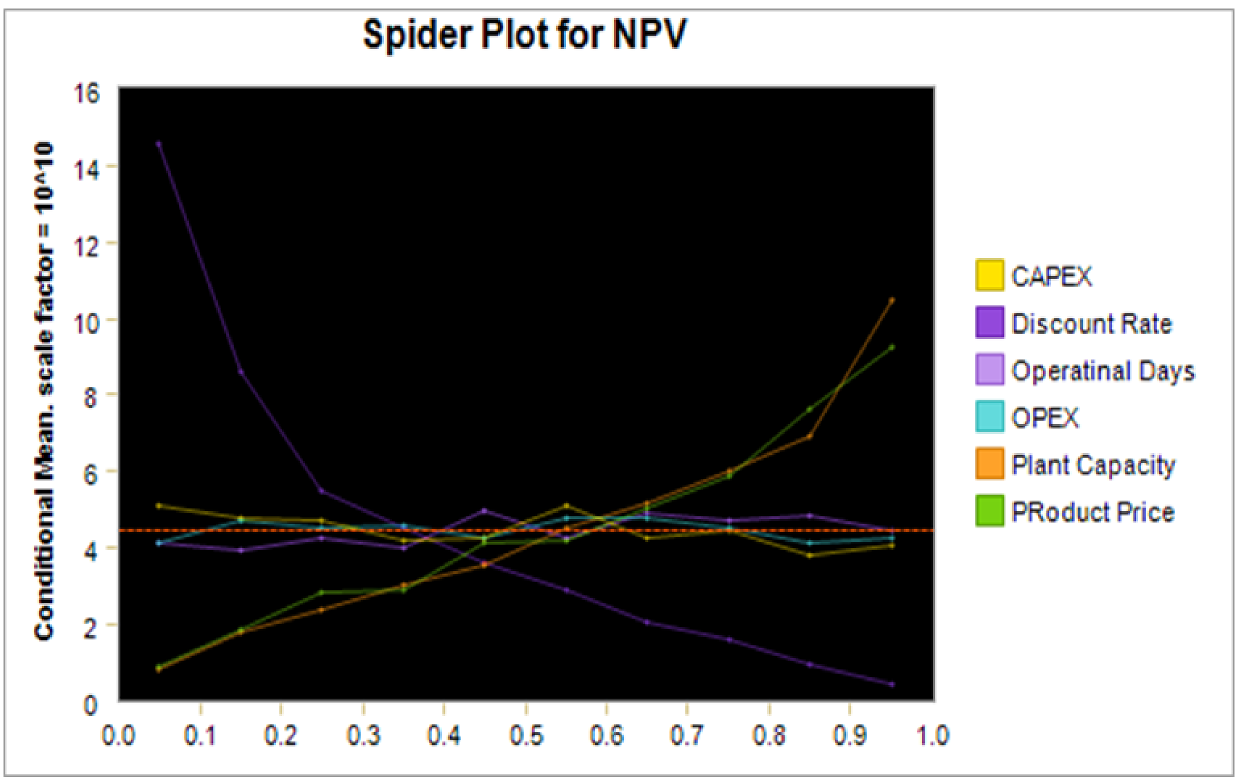

Figure 3: Spider Plot for NPV

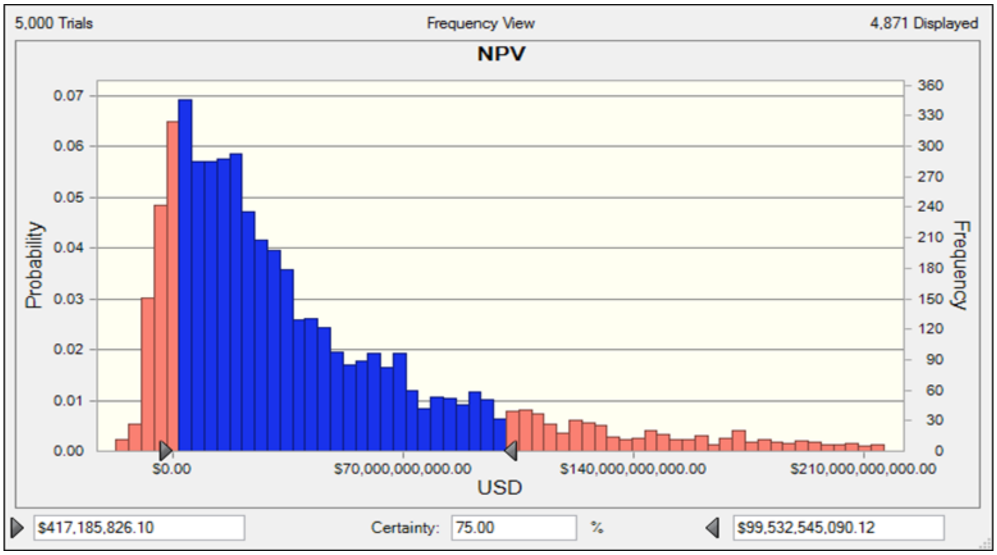

Figure 4: Histogram Plot for Risk Analysis

Figure 3 represent a Spider plot of the NPV that is obtained from 5000 trials. It can be seen that discount rate, product price and the plant capacity have the most effect on the NPV with the greatest being the discount rate. The Spider plot also revealed that discount rate affects the NPV negatively. The steeper the gradient of the plot representing a variable, the more sensitive the outcome is to it. The discount rate has the steepest gradient followed by the product price and lastly the plant capacity. The Plant capacity and product prices, affect the NPV positively, that is, an increased in these factors will lead to an increase in the NPV, while an increase in the discount rate will results to a decrease in the NPV. It implies that a decrease in investment discount rate and an increase in product price and plant capacity will favour offshore GTL investment in the Niger Delta offshore region in Nigeria.

Figure 4 represent the histogram plot. This plot provides the percentage risk associated with the investment. From the plot, there is a 75% certainty associated with the actualization of an NPV ranging from $500 Million to $100 Billion. This can be interpreted to mean that the investment has a 75% probability of being profitable within a profit range of $500 Million to $100 Billion and has a 25% risk associated with it. This level of certainty is still subjected to the investor risk preference.

5. CONCLUSION

This study has shown that Offshore application of Floating GTL will be viable in the Niger Delta as positive NPVs was obtained for all the plant sizes considered using World Bank recommended discount rate of 15% for oil and gas investment in Nigeria. The results also indicated that the discounted payback time for all considered cases when the product is sold at $60 bbl is less than half the useful life of the process facility, and also gave IRR greater than the discount rate. The sensitivity analysis of the NPV showed that the parameters which affects the NPV the most are the Discount Rate, Plant Capacity and Product Price. The discount rate has an inverse relationship with the NPV, while the product price and plant capacity exhibited proportionate relationship with the NPV. Also, the Risk Analysis showed that the investment has a 75% chances of being profitable with in a profit range of $500 Million to $100 Billion.

I recommend that further studies be conducted to compare the concept in this work with existing methods of transporting natural gas in the region.

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APPENDIX

		Expenditure			REVENUE		
S/N	Year	CAPEX	OPEX	TOTAL COST	PRODUCTION Vol	Cumm. Production Vol.	GROSS INCOME
0	**202X**	**$ 2,413,125,000.00**		**$ (2,413,125,000.00)**	****	****	****
0	**202X**	**$ 2,413,125,000.00**		**$ (2,413,125,000.00)**	****	****	****
0	**202X**	**$ 2,413,125,000.00**		**$ (2,413,125,000.00)**	****	****	****
0	**202X**	**$ 2,413,125,000.00**		**$ (2,413,125,000.00)**	****	****	****
1	202X		$ 289,575,000.00	**$ 289,575,000.00**	33000	33000	$ 673,200,000.00
2	202X		$ 289,575,000.00	**$ 289,575,000.00**	31054	64054	$ 1,306,701,600.00
3	202X		$ 289,575,000.00	**$ 289,575,000.00**	30821	94875	$ 1,935,450,000.00
4	202X		$ 289,575,000.00	**$ 289,575,000.00**	30129	125004	$ 2,550,081,600.00
5	202X		$ 289,575,000.00	**$ 289,575,000.00**	31737	156741	$ 3,197,516,400.00
6	202X		$ 289,575,000.00	**$ 289,575,000.00**	31666	188407	$ 3,843,502,800.00
7	202X		$ 289,575,000.00	**$ 289,575,000.00**	32413	220820	$ 4,504,728,000.00
8	202X		$ 289,575,000.00	**$ 289,575,000.00**	32150	252970	$ 5,160,588,000.00
9	202X		$ 289,575,000.00	**$ 289,575,000.00**	32192	285162	$ 5,817,304,800.00
10	202X		$ 289,575,000.00	**$ 289,575,000.00**	31060	316222	$ 6,450,928,800.00
11	202X		$ 289,575,000.00	**$ 289,575,000.00**	32457	348679	$ 7,113,051,600.00
12	202X		$ 289,575,000.00	**$ 289,575,000.00**	32485	381164	$ 7,775,745,600.00
13	202X		$ 289,575,000.00	**$ 289,575,000.00**	32018	413182	$ 8,428,912,800.00
14	202X		$ 289,575,000.00	**$ 289,575,000.00**	30018	443200	$ 9,041,280,000.00
15	202X		$ 289,575,000.00	**$ 289,575,000.00**	31832	475032	$ 9,690,652,800.00
16	202X		$ 289,575,000.00	**$ 289,575,000.00**	32970	508002	$ 10,363,240,800.00
17	202X		$ 289,575,000.00	**$ 289,575,000.00**	30061	538063	$ 10,976,485,200.00
18	202X		$ 289,575,000.00	**$ 289,575,000.00**	31960	570023	$ 11,628,469,200.00
19	202X		$ 289,575,000.00	**$ 289,575,000.00**	30882	600905	$ 12,258,462,000.00
20	202X		$ 289,575,000.00	**$ 289,575,000.00**	30546	631451	$ 12,881,600,400.00
21	202X		$ 289,575,000.00	**$ 289,575,000.00**	32293	663744	$ 13,540,377,600.00
22	202X		$ 289,575,000.00	**$ 289,575,000.00**	31768	695512	$ 14,188,444,800.00
23	202X		$ 289,575,000.00	**$ 289,575,000.00**	31800	727312	$ 14,837,164,800.00
24	202X		$ 289,575,000.00	**$ 289,575,000.00**	31801	759113	$ 15,485,905,200.00
25	202X		$ 289,575,000.00	**$ 289,575,000.00**	32714	791827	$ 16,153,270,800.00
26	202X		$ 289,575,000.00	**$ 289,575,000.00**	31077	822904	$ 16,787,241,600.00
27	202X		$ 289,575,000.00	**$ 289,575,000.00**	32655	855559	$ 17,453,403,600.00
28	202X		$ 289,575,000.00	**$ 289,575,000.00**	30291	885850	$ 18,071,340,000.00
29	202X		$ 289,575,000.00	**$ 289,575,000.00**	30863	916713	$ 18,700,945,200.00
30	202X		$ 289,575,000.00	**$ 289,575,000.00**	30948	947661	$ 19,332,284,400.00
31	202x		ABADONMENT				
TOTAL		$ 9,652,500,000.00					

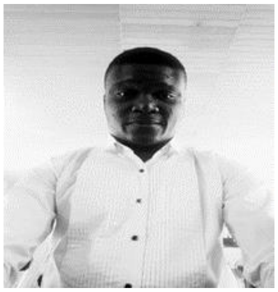
Table1: Expenditure and Revenue for Cash Flow Analysis

BEFORE TAX CASH FLOW			TAX
NWC	Depreciation	EBIT	
****	****	****	****
****	****	****	****
****	****	****	****
****	****	****	****
$ 383,625,000.00	$ 321,750,000.00	$ 61,875,000.00	$ 18,562,500.00
$ 1,017,126,600.00	$ 321,750,000.00	$ 695,376,600.00	$ 208,612,980.00
$ 1,645,875,000.00	$ 321,750,000.00	$ 1,324,125,000.00	$ 397,237,500.00
$ 2,260,506,600.00	$ 321,750,000.00	$ 1,938,756,600.00	$ 581,626,980.00
$ 2,907,941,400.00	$ 321,750,000.00	$ 2,586,191,400.00	$ 775,857,420.00
$ 3,553,927,800.00	$ 321,750,000.00	$ 3,232,177,800.00	$ 969,653,340.00
$ 4,215,153,000.00	$ 321,750,000.00	$ 3,893,403,000.00	$ 1,168,020,900.00
$ 4,871,013,000.00	$ 321,750,000.00	$ 4,549,263,000.00	$ 1,364,778,900.00
$ 5,527,729,800.00	$ 321,750,000.00	$ 5,205,979,800.00	$ 1,561,793,940.00
$ 6,161,353,800.00	$ 321,750,000.00	$ 5,839,603,800.00	$ 1,751,881,140.00
$ 6,823,476,600.00	$ 321,750,000.00	$ 6,501,726,600.00	$ 1,950,517,980.00
$ 7,486,170,600.00	$ 321,750,000.00	$ 7,164,420,600.00	$ 2,149,326,180.00
$ 8,139,337,800.00	$ 321,750,000.00	$ 7,817,587,800.00	$ 2,345,276,340.00
$ 8,751,705,000.00	$ 321,750,000.00	$ 8,429,955,000.00	$ 2,528,986,500.00
$ 9,401,077,800.00	$ 321,750,000.00	$ 9,079,327,800.00	$ 2,723,798,340.00
$ 10,073,665,800.00	$ 321,750,000.00	$ 9,751,915,800.00	$ 2,925,574,740.00
$ 10,686,910,200.00	$ 321,750,000.00	$ 10,365,160,200.00	$ 3,109,548,060.00
$ 11,338,894,200.00	$ 321,750,000.00	$ 11,017,144,200.00	$ 3,305,143,260.00
$ 11,968,887,000.00	$ 321,750,000.00	$ 11,647,137,000.00	$ 3,494,141,100.00
$ 12,592,025,400.00	$ 321,750,000.00	$ 12,270,275,400.00	$ 3,681,082,620.00
$ 13,250,802,600.00	$ 321,750,000.00	$ 12,929,052,600.00	$ 3,878,715,780.00
$ 13,898,869,800.00	$ 321,750,000.00	$ 13,577,119,800.00	$ 4,073,135,940.00
$ 14,547,589,800.00	$ 321,750,000.00	$ 14,225,839,800.00	$ 4,267,751,940.00
$ 15,196,330,200.00	$ 321,750,000.00	$ 14,874,580,200.00	$ 4,462,374,060.00
$ 15,863,695,800.00	$ 321,750,000.00	$ 15,541,945,800.00	$ 4,662,583,740.00
$ 16,497,666,600.00	$ 321,750,000.00	$ 16,175,916,600.00	$ 4,852,774,980.00
$ 17,163,828,600.00	$ 321,750,000.00	$ 16,842,078,600.00	$ 5,052,623,580.00
$ 17,781,765,000.00	$ 321,750,000.00	$ 17,460,015,000.00	$ 5,238,004,500.00
$ 18,411,370,200.00	$ 321,750,000.00	$ 18,089,620,200.00	$ 5,426,886,060.00
$ 19,042,709,400.00	$ 321,750,000.00	$ 18,720,959,400.00	$ 5,616,287,820.00

AFTER TAX CASH FLOW		
Discount Rate @ 15% DF	Discounted Cash Flow 15% DF	Cumm Discounted Cash Flow @15% DR
1	$ (2,413,125,000.00)	$ (2,413,125,000.00)
1	$ (2,413,125,000.00)	$ (4,826,250,000.00)
1	$ (2,413,125,000.00)	$ (7,239,375,000.00)
1	$ (2,413,125,000.00)	$ (9,652,500,000.00)
1.15	$ 317,445,652.17	$ (9,335,054,347.83)
1.3225	$ 611,352,453.69	$ (8,723,701,894.14)
1.520875	$ 820,999,424.67	$ (7,902,702,469.47)
1.74900625	$ 959,904,871.69	$ (6,942,797,597.77)
2.011357188	$ 1,060,022,552.56	$ (5,882,775,045.21)
2.313060766	$ 1,117,253,164.47	$ (4,765,521,880.75)
2.66001988	$ 1,145,529,821.93	$ (3,619,992,058.82)
3.059022863	$ 1,146,194,146.81	$ (2,473,797,912.01)
3.517876292	$ 1,127,366,493.56	$ (1,346,431,418.45)
4.045557736	$ 1,089,954,203.61	$ (256,477,214.83)
4.652391396	$ 1,047,409,429.94	$ 790,932,215.11
5.350250105	$ 997,494,381.53	$ 1,788,426,596.64
6.152787621	$ 941,696,970.00	$ 2,730,123,566.63
7.075705764	$ 879,448,454.63	$ 3,609,572,021.26
8.137061629	$ 820,600,821.81	$ 4,430,172,843.07
9.357620874	$ 763,879,105.23	$ 5,194,051,948.31
10.761264	$ 704,133,095.96	$ 5,898,185,044.27
12.37545361	$ 649,168,199.91	$ 6,547,353,244.18
14.23177165	$ 595,480,739.21	$ 7,142,833,983.39
16.36653739	$ 544,461,089.48	$ 7,687,295,072.87
18.821518	$ 497,945,320.83	$ 8,185,240,393.70
21.6447457	$ 453,954,691.60	$ 8,639,195,085.30
24.89145756	$ 412,986,577.27	$ 9,052,181,662.57
28.62517619	$ 374,983,059.26	$ 9,427,164,721.83
32.91895262	$ 340,263,318.50	$ 9,767,428,040.33
37.85679551	$ 307,603,733.02	$ 10,075,031,773.36
43.53531484	$ 278,192,659.56	$ 10,353,224,432.92
50.06561207	$ 250,546,432.62	$ 10,603,770,865.54
57.57545388	$ 225,521,177.27	$ 10,829,292,042.81
66.21177196	$ 202,779,976.78	$ 11,032,072,019.59
ABADONMENT		
NPV =	$ 11,032,072,019.59	

Table 2: Before-Tax and After – Tax Cash Flow Analysis

Authors



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