Strategies for Economic Development of Marginal Oil Field in Nigeria

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Abstract
The aim and objectives of the study are to examine the success factors underlying the development of marginal oil field by Niger Delta Exploration and Production Company in Nigeria. An extensive literature review on the development of marginal oil field was carried out and specifically the Ogbelle marginal oil field development project was used as a case study. The study reveals that there are three important conditions relevant to explain the success: The know-how developed by Niger Delta Exploration and Production Company through collaboration with third parties. Risk management among which are the formation of partnership, joint venture and effective monetization of natural gas and the role of capital market in funds raising which helps in the development of marginal field project. It is recommended that the best route is to forge joint action program by combining best practices by marginal field operators, the government and other stakeholders. The overall significance of the study is to contribute to knowledge on the management of hydrocarbon resource base for economic sustainability in Nigeria.

Keywords: marginal fields, knowledge sharing, risk management, critical success factors, indigenous companies

INTRODUCTION
To accomplish the goal of reduction in abandonment of oil and gas fields, marginal field development program was initiated by the Federal Government of Nigeria. Among others the benefits of the program aside from the anticipated revenue from an improved production base, the government is also aiming at building up indigenous participation in the Nigerian upstream oil and gas sector as noted by (Akinpelu and Mole, 2009). Marginal field development will help to mobilize resources that would otherwise remain in the hands of investors and employ people productivity by so doing, capital formation which is a vital engine of economic growth is encouraged. Argument against production from marginal oil fields centred on the fact that it is uneconomic. For a country such as Nigeria that operates under Organisation of Petroleum Exporting Countries (OPEC) - it means substitution of high cost oil for low cost uneconomically produced oil. The viewpoint here is that the question of feasibility or practicability cannot be decided solely from economic perspective. National development and technology transfer are equally important, other positive externality also accrue as put by (Omorogbe, 2001). Marginal field development can offer a number of economic, social and technical benefits, some of which are summarized as follows:

**Economic Opportunity**
1. It will attract increased private sector capital inflow in the oil and gas industry through generous fiscal regime.
2. It will expand upstream sector of the oil and gas industry by increasing oil and gas production as the crude produced from the field will be added to the national oil production quota.
3. It will provide alternatives sources of funding for the exploitation of hydrocarbon resources

**Social opportunity**
1. Developing marginal oil fields will generate employment for highly skilled Nigerian professionals and people in the host community.
2. It will enhance indigenous capability in such a vital industry and national security
3. It will add depth and breadth to stock market

**Technical opportunity**
1. It will accelerate the process of technology acquisition and diffusion in the oil industry
2. Promote common usage of assets/facilities to ensure optimum utilization of available excess capacity

In order to develop marginal field in Nigeria, it is useful to learn from example of success. NDEP has pioneered...
the development of marginal oil field. The purpose of this paper is to analyse the development of marginal oil field by NDEP and thereby contribute to formulating policies in Nigeria that overcome barriers and enhances marginal field development. What are the important conditions contributing to success of NDEP? To explore these points the paper begins with the definition and categorization of marginal oil field, analyse the case of NDEP through framework incorporating factors influencing the development of marginal oil field and conclude with findings.

Definition and Categorization of Marginal Oil Fields
A definition of marginal fields is depended on mixture of specific conditions. Hydrocarbon resources, oil price, technical feasibility, operating company portfolio, commercial frame work and regulatory issues. Marginal fields can be broadly defined as oil and gas fields which are uneconomic to develop due to reserve size, complexity, fiscal and market conditions, or distance from nearby infrastructure. They could also be low volume producing fields near the end of their economic life where revenue is below operating expenditure.

Marginal field are mainly located in areas that are very far from existing production facilities, investors find it difficult to develop this type of field because of it nature which when tied to economics lack attractiveness. Frost and Sullivan (2014), posited that the prospect may be capable of yielding an economic return to the oil company only by using some innovative, technical and financial options. Technological enhancements, increasing gas demand, and rising oil prices have made marginal fields attractive for development, propelling the growth of drilling rigs and pipeline installations.

According to Department of Petroleum Resources (DPR) guidelines, marginal fields have the following characteristics:

i. Reservoir size (small)
ii. Infrastructure distance/technology
iii. Inaccessibility of the area remoteness or location onshore or offshore
iv. Fiscal policy or high capital expenditure requirement
v. Market for the oil/gas or low or high price
vi. Cost of development/ resource size
vii. Petroleum type oil or gas
viii. Status of existing operation or new operation

In summary a field may be categorised as marginal under the following consideration:

i. Producing fields which have become uneconomical when close to or passed abandonment limits. That is field abandoned due to economic reasons

ii. Marginal fields are small fields which cannot produce 10,000 barrels per day and are adjudged not viable for development by the leaseholder.

Background
In 2003, the Nigerian independent upstream companies where restricted to the operariship of marginal oil and gas fields, when some fields where awarded to these local companies. Apart from awarding twenty (24) marginal oil fields to these local companies, the government also encouraged these operators to merge so as to raise capital to develop these fields. However despite the marginal field policy to encourage the local operators to develop these wasting oil and gas assets only about 30 percent of these fields are producing hydrocarbons after 12 years. The potential of marginal field in Nigeria is considerable. However marginal fields contribute only 2.1 percent to the oil and gas production (Wood Mackenzie 2012).

Statement of Problem
Despite policy initiative and considerable potentials for marginal oil fields in Nigeria, the development of marginal oil field has been lagging or has not been fully successful. The problem to be investigated is what are the factors influencing the development of marginal oil fields in Nigeria?

The main problems against the development of marginal oil fields in Nigeria are, funding, inadequate of technology and support infrastructure, lack of appropriate cost structure to support the economics of development of marginal oil fields.
Experiences in other countries that have profitably succeeded in marginal field development program have shown that in addition to regulatory framework and economics, the long-term successful development of marginal oil fields require synergy between the Nigerian government and the private investors. Currently, there is no enough collaboration on the development of marginal oil fields between indigenous company and the IOC/NNPC the owners.

METHODOLOGY
An extensive literature review on marginal oil field development project was carried out and specifically the Ogbelle marginal field project in Nigeria was used as a case study.

DISCUSSION
Knowledge Sharing
The oil and gas industry is knowledge-intensive, and key resources for value creation, such as geoscientists and engineers, need to collaborate and communicate effectively to manage the reserves. Knowledge is a crucial source of competitive advantages and strategic decisions are based on it.

Marginal field operators use knowledge sharing and advanced business practice to improve operational efficiency. For example by tapping the experience and best practice of Chevron in Niger Delta and combining it with their unique knowledge of local terrain and customs, marginal field operator the Niger Delta production and exploration Plc has successfully utilized indigenous resources. The Ogbelle field development project is an excellent example of such a partnership. NDEP and PETRE and their joint venture agreed to operate the Ogbelle field to modern international standard and in line with good oilfield practices. Since Ogbelle field lies with the NNPC/Chevron OML 54, the agreed arrangements require that the field development be subjected to Chevron’s corporate global standards, which are generally much higher than those of established by the America Petroleum institute.

The learning process includes learning from and sharing experience by interacting with societal and technical actors. The main objective of learning is to overcome market entry barriers as for example uncertainty and lack of knowledge.

Risk Management and Formation of Partnership
The Marginal field operators in Nigeria operate within the framework of standard oil and gas practice. Standard practice here refers to the efficient asset/liabilities management and the attending risk. In risk management, the marginal field operators like the IOC have to satisfy the requirement of the investors.

Niger Delta Exploration and Production Plc (NDEP) and Niger Delta Petroleum Resources (PETRE) along with another partner formed a joint venture (the OgbelleJV) for the purpose of implementing the Ogbelle marginal oil field development (the Ogbelle project). The Ogbelle oil field located within OML 54 held by the Nigerian National Petroleum Corporation (NNPC)/Chevron joint venture (the Ogbelle field) was exploited by the Ogbelle JV under a farm out agreement dated 7th August 2000 (the Farm out Agreement) through which the NNPC/Chevron joint venture assigned an equitable interest in the marginal reservoirs within the Ogbelle field to PETRE. The initial promoters of NDEP own PETRE, which has in turn, as most of its own participation interest in the joint venture, assigned the equitable interest in the production from Ogbelle field and processing the associated gas in to higher-value products. The product generated by the project are crude oil, natural gas liquid (NGLs) and liquefied petroleum gas (LPG).

As is common in oil and gas industry, a number of companies entered into a joint venture for the development of the Ogbelle field. This arrangement allows for the diversification and sharing of project risks as well as the pooling of needed capital and industry expertise. The Ogbelle JV provides, inter-alia, for the contribution ratios of working interests or cash calls.

Investment Strategy
Strategy for marginal field development is a long term plan by which investors can turn marginal field into financial success. The key steps for successful investment in a venture or project are: opportunity identification, value proposition, market assessment, strategy & plan, implementation. The Ogbelle JV (and PETRE/NDEP’s) modular approach to the project evaluation and adoption of a phased approach to developing matured opportunities and projects are all designed to minimize controllable risk.

Sustainability Issues
When implementing marginal field development it is important to address sustainability issues. The case of NDEP suggests two different sides to sustainability that is vital to the development of marginal oil fields. These are gas monetization or utilization and concern about market conditions.

Gas Utilization
The thrust of any management strategy is for a viable utilisation of natural gas in developing oil fields. Koso
and Onwuachi-Iheagwara (2013) posited that one of the basic facts that indigenous companies must leverage on to optimize the operation of marginal field in Nigeria is greater acknowledgment of natural gas as a strategic asset. In Nigeria the monetization of natural gas was not a major input to the overall business strategies of the major and marginal field operators. Natural gas was perceived as an unwanted by-product of crude oil production.

Table 1: Gas production and utilization (MSCF) by Marginal field operators

<table>
<thead>
<tr>
<th>Marginal fields companies</th>
<th>Gas produced</th>
<th>Gas used as fuel</th>
<th>Gas sold to third party</th>
<th>Gas sold to NGC</th>
<th>Gas reinjected</th>
<th>Gas for LNG/NGL as feed stock</th>
<th>Total gas utilized</th>
<th>Gas flared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energia Ltd</td>
<td>1,755,000</td>
<td>332,523</td>
<td>-</td>
<td>89,400</td>
<td>-</td>
<td>3,333,077</td>
<td>1,333,077</td>
<td></td>
</tr>
<tr>
<td>Midwestern oil and gas</td>
<td>398,150</td>
<td>19,792</td>
<td>-</td>
<td>-</td>
<td>19,792</td>
<td>378,358</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niger Delta petroleum</td>
<td>5,482,999</td>
<td>92,426</td>
<td>1,976,349</td>
<td>20,862</td>
<td>2,910,295</td>
<td>4,999,932</td>
<td>483,067</td>
<td></td>
</tr>
</tbody>
</table>

Sources: NNPC annual statistical bulletin 2014

As shown in the table 1 Niger Delta Petroleum utilizes over 90 percent of its total gas production while flaring less than 10 percent. By reducing gas flaring, the company is improving energy efficiency and mitigating climate change. Instead of wasting this valuable resource, there is the need to develop gas market and infrastructure so the associated gas can be utilized to generate electricity and cleaner cooking fuels.

Market Condition
Market condition for marginal field development are affected and shaped by government policy. In fact policy intervention are often needed for the development of market for marginal field

According to Shuaheeb (2000), the current fiscal regime relating to marginal fields does not make the development of these fields attractive in Nigeria. It only offers a reduction of 19.25% in petroleum profit tax. This does not adequately reflect the fact that the operation of these fields requires the use of unconventional equipment/technology, which by nature is more expensive. The cost of acquiring further reservoir information for marginal fields may sometimes be very high that the field development becomes marginal. Unfavourable fiscal regime to the investors results in lower rate of return due to higher per barrel capital and operational expenditure. The protracted payback delays the period from which the project earns a profit from which debts are to be fully paid. Fiscal reform should aim at creating an environment in which investment will be attractive to new entrants as well as incumbents, while retaining maximum value for Nigeria as a whole.

The capital Market
Financing the capital market can be used to source funds and realize their locked in values through listing of shares. Listing of the company share would enable it to attract investors and also distribute values to Nigeria. Given the right regulatory and institutional frame work, the capital market will continue to be a very important catalyst for wealth creation and also help the development of marginal oil field in Nigeria.

The Niger Delta exploration and production (NDEP) Prospectus (2001) stated that: To meet its financial obligation, in 2001 the NDEP offered ordinary shares and private placement of Irredeemable Participating Investment Notes to raise $5,920 million and $6,823 million respectively for the development of the field but had inadequate subscribers. As a result it re-launched the offer to make up the remaining fund.

Case Study of Collaboration in the Development of Marginal Oil Field in Nigeria
Niger Delta Exploration and Production Plc (NDEP) and Niger Delta Petroleum Resources (PETRE) along with another partner formed a joint venture (the Ogbelle JV) for the purpose of implementing the Ogbelle marginal oil field development (the Ogbelle project). The Ogbelle oil field located within OML 54 held by the Nigerian National Petroleum Corporation (NNPC)/Chevron joint venture (the Ogbelle field) was exploited by the Ogbelle JV under a farm out agreement dated 7th August 2000 (the Farm out Agreement) through which the NNPC/Chevron joint venture assigned an equitable interest in the marginal reservoirs within the Ogbelle field to PETRE. The initial
The research contributes to a better understanding of the success related to the development of marginal oil field and provides decision makers in Nigeria with guidance on the way forward for marginal oil field development. It contributes to the knowledge by providing a detail overview of the sustainability indicators for marginal oil fields.

Limitation of study
The study is limited by the inability to gather production data for economic analysis and profitability indicators. Also development of marginal fields in Nigeria is a new field with growing importance in Nigeria and thus policy for its promotion has not been fully developed. It is acknowledged that conducting case study analysis with one company will not yield the level of comprehensive data necessary for the development of an exhaustive conceptual frame work to describe the success factors of marginal oil field development policy. However the chosen approach succeed in achieving a level of research introspection necessary to reveal new insight that contribute the cumulative progressive development of such conceptual frame work

CONCLUSIONS AND RECOMMENDATIONS
Based on the discussion the following conclusions are made: The critical success factors for Ogbelle field development were identified as: Risk management through the formation of partnership, effective utilization of natural, collaboration with third party and the role of stock market.

- The stock market has played a vital role in the development of Ogbelle marginal field. The government should ensure that it creates an enabling environment for the development of stock market and other financial institutions to handle funding issues.
- Government should overhaul its gas policy and fiscal framework on marginal field to ensure that it attracts investment in marginal oil field development.
- There should be vigorous collaboration in the areas of knowledge sharing and partnership formation between the marginal field operators, and other stakeholders like the IOCs and the government agencies the NNPC and DPR.
- A comprehensive integrated technology and support infrastructure is needed. Such as power, pipelines, terminals export and functional refineries. This will aid in monetization and utilization of natural gas from marginal field operators.

Abbreviation
DPR= Department of Petroleum Resources
NNPC= Nigerian National Petroleum Corporation
NDPR= Niger Delta Exploration and production Company
NDPETRE = Niger Delta Petroleum Resources
NGL= Natural Gas liquid
LPG= Liquid petroleum gas
SPDC= Shell Petroleum development Company
JV =Joint venture
OPEC= organisation of Petroleum Exporting Countries.
OML= Oil mining lease

REFERENCES


Omorogbe, Y. 2001: Oil and Gas Law in Nigeria simplified: Benin Malthous press Ltd


