

ABSTRACT

In recent times, the exploration and production of shale oil in the United States (US) has risen significantly, as the country seeks to reduce its heavy dependence on imported crude from oil producing countries such as Nigeria. This development has crucial implications for the Nigerian economy which is largely driven by revenue from oil, even as the US targets energy self-sufficiency by 2035. This Paper examines the implications of the US shale oil revolution for the Nigerian economy. It begins with the definition and the brief history of shale oil, and explores the recent advances in shale oil development in the US. The impact of shale oil on the global energy market and the Nigerian economy are also discussed. The Paper concludes with short and long term policy options to curtail likely negative impacts of the shale oil development on the Nigerian economy.

1.0 INTRODUCTION

The Nigerian economy depends largely on crude oil for both revenues and foreign exchange earnings. According to the CBN¹, crude oil exports accounted for 97% of total export value in 2012 and 75% of gross federally-collected revenue in the same period. These statistics underscore the importance of crude oil to Nigeria's economic performance as well as the linkage between the latter and the development of cheaper alternative energy in other parts of the world. For instance, rapid technological advances in the development of shale oil by the US have resulted in the country's lower demand for crude oil from Nigeria. This is critical given the fact that the US is the largest importer of Nigeria's crude, accounting for 33% of our crude oil exports (according to the EIA²).

Furthermore, recent forecasts by PricewaterhouseCoopers (PwC) projects the price of oil to decline in the international oil market; and this would improve the terms of trade for net oil importers, like the US, while crude oil exporters, like Nigeria suffer lower terms of trade.³ This presents a grave situation for Nigeria which is not only a net exporter, but also depends on oil revenue to finance a large portion of the government budget and activities.

1.1 DEFINITION AND HISTORY OF SHALE OIL

Oil shale, also known as kerogen shale, is an organic-rich fine-grained sedimentary rock containing kerogen (a solid mixture of organic chemical compounds) from which liquid hydrocarbons called "shale oil" can be produced.

Oil shales are formed by the deposit of silt and organic debris on lake beds and sea bottoms. Over time, heat and pressure transform the materials into oil shale in a process similar to that of crude oil. Oil shale generally contains enough oil such that it will burn without any additional processing, hence it is also known as "the rock that burns".

For centuries long, people have heated shales to coax the oil out of the stone. However, commercial production began in France in the 1830s during which large quantities of shale were mined and heated in specialized ovens called retorts. Following the French lead, and improvement in methods, Scottish energy entrepreneurs initiated an oil shale industry around Edinburgh in 1850 that successfully operated for over a century into the 1960s.

The first small processing facility for shale was opened in Alberta, Canada, in 1815. However by 1859, interest in shale subsided due to the birth of the modern American petroleum industry which quickly made oil shale an unprofitable venture in places that had access to conventional crude oil.^{4,5}

Although oil shale, in the 19th century, was a major source of energy in some countries, many others relied on the use of conventional oil owing to the fact that oil shale is relatively difficult and more expensive to recover or produce than the free-flowing crude and also because many countries do not have significant oil shale reserves.

The relatively high prices of conventional hydrocarbon oil in the 1970s and 1980s stimulated the need for cheaper alternative source of energy. This resulted in the quest for improved shale oil technology during this period. However, the sharp decline in crude oil prices in the 1980s reduced this urge and led to a halt in research and development activities.

2.0 RECENT ADVANCES IN OIL SHALE DEVELOPMENT IN THE UNITED STATES OF AMERICA

As crude oil prices in the international oil market fluctuated, the quest for alternative energy sources, which were also geographically accessible to the US resumed and were viewed as more reliable alternatives to foreign supplies.

Among the United States' unconventional fuel portfolio, oil shale is noteworthy because of the extraordinary size of the resource. While oil shale is found in many places worldwide, the United States has the largest deposits in the world, with significant volume located in some parts of Colorado, Utah, and Wyoming, collectively referred to as the Green River Basin or Green River Formation.

Estimates of the total resource in the US that could be conceivably recovered, exceeds 2 trillion barrels (277 billion tonnes) - eight times the size of Saudi Arabia's oil reserves.⁶ Although not all the resources will be recoverable, even a moderate estimate of 800 billion barrels of recoverable oil from shale in the Green River Formation is three times greater than the proven oil reserves of Saudi Arabia.

Pegging US demand for petroleum products at approximately 20 million barrels per day (mbpd) in 2012, it is projected that the estimated 800 billion barrels of recoverable oil would last for more than 400 years assuming oil shale could be used to meet a quarter of demand in the US.⁷

These tremendous domestic oil shale reserves are touted as a solution to the twin problems of declining worldwide crude oil production and increasing US dependence on foreign energy suppliers.

It is pertinent to note that this is not the first time that oil shale has been promoted as a solution to energy insecurity in the United States. In the 1960s and in the 1970s during the embargo on oil⁸, the US government encouraged mineral rushes intended to develop oil shale into a major energy resource. However, despite intense efforts, these attempts were unable to turn oil shale into a viable commercial energy resource.

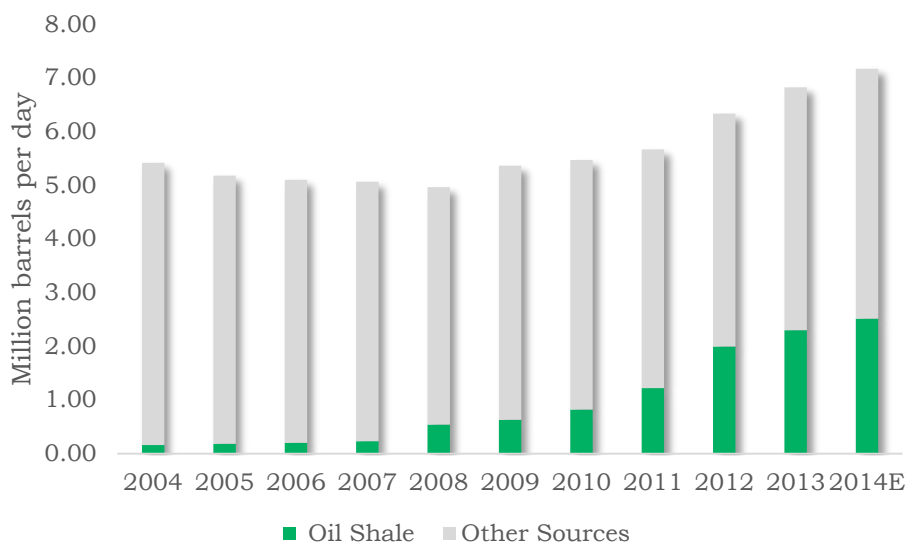
Recently, interest in the development of US oil shale resource has increased with advancements in hydraulic fracturing technologies as well as the introduction of the Energy Policy Act of 2005, which helped release land for oil shale research and development. In 2008 the US Department of the Interior finalized rules and regulations for the leasing of approximately 2 million acres in Colorado, Utah, and Wyoming. The regulations set the stage for what is now known as the Oil Shale Revolution that is rapidly changing the dynamics of global energy markets.



In the last few years, shale oil production in the US has recorded remarkable improvements – rising by a 26% compound annual growth rate (CAGR) to 553,000 bpd in 2011 from 110,000 bpd in 2004⁹.

The US Energy Information Administration also expects US crude oil production to continue to grow rapidly over the next two years, increasing from an average 6.5 mbpd in 2012 to 7.3 mbpd in 2013 and 7.9 mbpd in 2014. Drilling in tight oil plays in the onshore Williston, Western Gulf, and Permian basins account for the bulk of forecast production growth over the next two years.¹⁰

Fig. 1: US Domestic Crude Oil Production (Oil Shale vs. Other Sources) 2004 – 2014



Sources: EIA Annual, NESG Research

Notes:

- “Other Sources” includes Indonesia, China, Taiwan, Singapore, Malaysia, Japan and Thailand.
- “Other Africa” includes Cote d’Ivoire, Cameroon, Ghana and Senegal.
- “Other Europe” includes Germany, Portugal, Ireland, Gibraltar and Norway.
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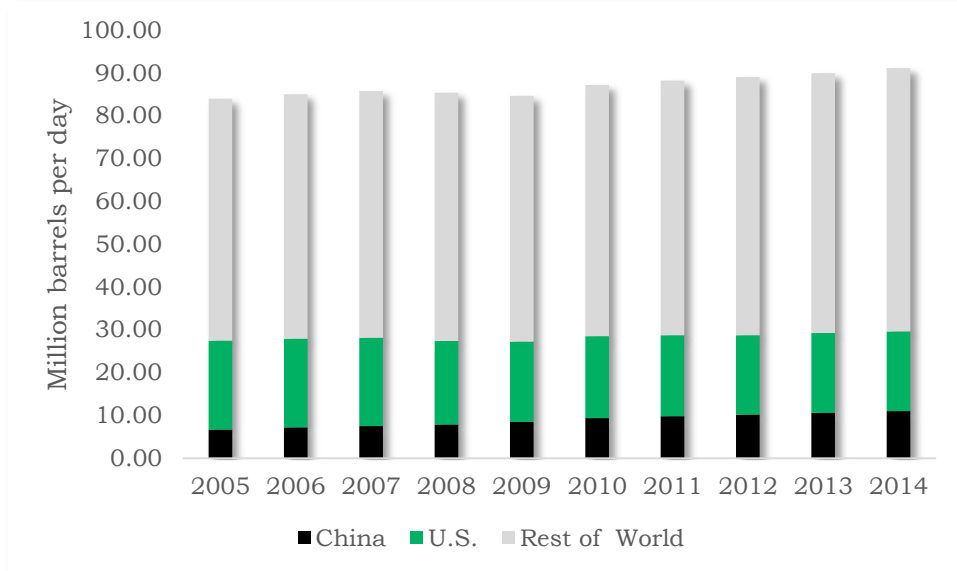
2.1 IMPACT ON THE GLOBAL ENERGY MARKET

Increased oil shale production in the US has caused a drop in the demand for foreign light sweet crude imports as American refiners choose to use oil from shale rather than the more expensive foreign grades. This has led to a decline in crude oil imports in the US. For instance, US oil imports from West Africa have dropped significantly and imports from Nigeria fell to an estimated 150,000 bpd in January 2012 from around 600,000 bpd in January 2011.¹¹

The expectation is that this trend will continue as the US moves towards energy independence. Eventually foreign crude from any part of the globe will not make its way to the US if the shale boom proves sustainable. In addition to this, the discovery of oil shale has caused a fall in US gas prices thus ending the 30 year reign of West Texas Intermediate (WTI) as a benchmark oil reference in financial markets. Also as a result of the oil shale boom, unconventional resource transactions drove at least a third of global energy transactions in 2012. International Oil Companies (IOCs) and National Oil Companies (NOCs) dominated mergers and acquisition activities as they sought to increase their investments in order to benefit from the shale boom.¹²



Fig. 2: Annual Consumption of World Liquid Fuels (2004 – 2014).



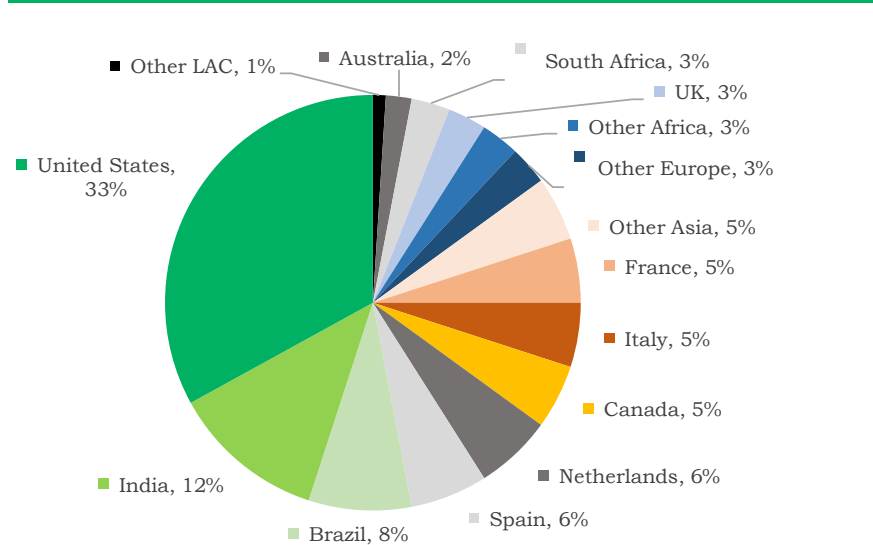
Sources: EIA Annual, NESG Research

2.2 IMPACT ON NIGERIA

2.2.1 Reduced Demand for Nigeria’s Crude Oil Output

In the short time that oil shale has made a comeback to the energy scene, demand for Nigeria’s crude in the US has experienced a severe decline as stated above from 600,000 bpd in January 2011 to 150,000 bpd in January 2012. Between 2011 and 2012, Nigeria fell from being the third largest supplier of crude oil to the United States to the sixth largest supplier after Canada, Saudi Arabia, Mexico, Venezuela and Russia in September 2011. In addition to this decline, there are indications that by 2014, the US would no longer be importing crude oil from Nigeria.¹³

Fig 3: Nigerian Crude Oil Exports by Destination, 2012¹⁴



Sources: EIA, NESG Research

Such combination of declines in crude oil prices; US demand for Nigerian crude; and Nigeria's oil production all point to imminent revenue shortfalls that would impact budget financing, foreign exchange inflows and our foreign reserves negatively.

It would be recalled that the federal budget for 2013 is based on 2.53mbpd and an oil benchmark price of US\$79 per barrel.¹⁵ While the current oil price is well above the benchmark price, the question is whether the lower oil benchmark price will be sufficient to net off the effect of lower crude output in a manner that will not increase Nigeria's fiscal deficit. Between Q4-12 and Q1-13, Nigeria has already experienced a 5.6% decline in crude oil prices and there are long term projections of up to 40% drop in oil prices from now till the year 2035.¹⁶

2.2.2 IOC Divestments and Indigenization of Oil Companies

More recently, many IOCs have divested their onshore interests in Nigeria. These divestments have brought about new entrants into Nigeria's oil and gas industry and has increased investments by indigenous companies in the industry. Between 2008 and 2013, oil majors such as Royal Dutch Shell, Petrobras, Total, Conoco Phillips and ENI have divested US\$5 billion worth of onshore oilfields and other assets, selling them to local companies.¹⁷

Analysts' attribute insecurity, oil theft, unfavourable profit-sharing agreements, high taxes and royalties as some of the reasons behind the divestments. We believe the non-passage of the Petroleum Industry Bill (PIB) and rapid developments in the alternative energy space just as responsible for the strategic shift of IOCs.

While the increased participation of local companies in exploration and production in the industry can be seen as a positive development, we note that the dimensions of impact need to carefully analysed before a conclusion is drawn.

3.0 POLICY OPTIONS

In view of the US' *shale path* to energy independence vis-à-vis the global developments in alternative sources of energy as well as the outlook of falling crude oil prices, we highlight some of the policy options available to Nigeria as short to long term strategies towards ensure the economy is relatively insulated from the negative impact of the shale oil revolution.

3.1 Identify and Harness All Energy Sources Available to Nigeria.

It is imperative for Nigeria to identify and determine its energy sources and harness them properly. While other countries are turning to nuclear power as a source of energy, others still rely on coal (despite its negative environmental impact), while others are turning to renewable sources of energy or a combination of diverse sources.

Nigeria has vast natural gas, coal, and renewable energy resources (solar, hydro, bio fuels) that could be used as energy sources. What is however required is the mapping out of these sources and their potential as well as the development and implementation of proper policies to harness these resources to develop new (and improve current) energy and electricity infrastructure.

While it can be said that government is making considerable progress in the power sector by unbundling the Power Holding Company of Nigeria, and the subsequent privatization of the distribution and generation companies, among others; a lot still needs to be done in the sector to improve capacity.

3.2 Explore Asian Markets as a Short Term Measure.

With the loss of the United States as Nigeria's number one crude export destination, Nigeria is forced to focus its attention on energy reliant Asian countries like China, India and South Korea. Indeed, India is already in the number one spot as it was scheduled to import 17% of Nigeria's production in May 2013.

In our opinion, seeking Asian markets should be a short term strategy for the Nigerian government to cushion revenue shortfall effects, which may not be sustainable in the long run as other West African countries that produce crude oil will eventually seek access to these markets.

3.3 Invest in Oil Refineries to Deepen Local Supply.

Nigeria currently has a population of approximately 170 million and energy demand is met through a combination of domestically refined and imported petroleum. There is the scope for the growth in domestic demand and consumption and perhaps it is time for the government to create and maintain an enabling environment for the private sector to invest in oil refining in Nigeria. Investment in refineries in Nigeria will serve the dual purpose of reducing Nigeria's import burden (in terms of importing refined crude products) as well as cater for a huge domestic market.

3.4 Explore Nigeria's Oil Shale Reserves.

Research has shown that mid-cretaceous oil shale deposits exist in the Lokpanta area of the Abakaliki Anticlinorium, a depocenter in the Lower Benue trough of Nigeria.¹⁸ The reserves are estimated at 5.79 billion tonnes with a recoverable hydrocarbon reserve of about 1.7 billion barrels.¹⁹

While this is in no way close to China's reserves of 720 billion tonnes or that of the United States which is estimated at nearly 74% of the world's potential recoverable shale oil resources, it may serve as a pointer to the fact that Nigeria may have undiscovered oil shale deposits around the country.

3.5 Diversify Nigeria's Economic Base.

We believe diversifying the production base, will continue to be the most viable alternative for growing the Nigerian economy and ultimately reducing poverty. Manufacturing, agro-processing, tourism and solid mineral extraction hold promise for the nation's output. The potential of these sectors to contribute meaningfully to Nigeria's economy will be stifled unless the issues surrounding infrastructure, energy, security and competitiveness can be resolved.

END NOTES & REFERENCES

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