Journal of Environmental Management 204 (2017) 207–220

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Research article

From declared asset retirement obligations to a decommissioning cost estimate for onshore crude oil fields in Nigeria

Erovie-Oghene U. Afieroho [a, *], Shirish L. Patil [b], Abhijit Dandekar [a], Robert Perkins [a], Douglas Reynolds [a]

[a] University of Alaska Fairbanks, AK 99775-5880, USA
[b] King Fahd University of Petroleum and Minerals, Dhahran, 31261, Saudi Arabia

ARTICLE INFO

Article history:
Received 23 April 2017
Received in revised form
27 June 2017
Accepted 22 August 2017
Available online 4 September 2017

Keywords:
Decommissioning
Environmental liability
Onshore field
Nigeria
Cost estimate

ABSTRACT

As in most mature crude oil producing regions, asset divestment has commenced in Nigeria. Decommissioning and associated environmental liabilities are expected to become important problems requiring attention. Public and government engagement on decommissioning will be ineffective without information on cost of decommissioning liabilities, which are held confidential by oil companies. This study demonstrates a method to determine generic aggregate cost of decommissioning liabilities for Nigeria onshore fields, using non-proprietary data from annual financial reports of operating companies in Nigeria. The results can be used as basis for negotiation with operators and to help government in preparation for decommissioning risk.

© 2017 Elsevier Ltd. All rights reserved.

1. Introduction

Petroleum mineral resources are finite and non-renewable, and as such cannot be extracted in perpetuity. In most crude oil producing countries, several oil fields are beginning to experience significant production declines. The International Energy Agency (IEA, 2013) observed that the average production-weighted decline rate worldwide was approximately 6.0% in 2012 for post-peak fields. S&P Global Platts (2016) projected that the production decline rate for non-OPEC producers was approximately 5% in 2016 and that an even higher rate held for OPEC producers. These observations support the position of Simmons (2002) that eventually, most of the world's current population of giant fields will all be in decline and their economic operations will cease.

The petroleum business cycle runs from field exploration, development, production to decommissioning and abandonment, when a field becomes unprofitable for production. With deterioration in integrity of infrastructures due to old age, associated production decline, and increasing environmental concerns, decommissioning of oil fields has become a very important activity and a contentious topic in recent times. Wood Mackenzie (2016) estimated the cost of decommissioning for facilities in the North Sea to be approximately US$ 40 billions. According to the UK's fiscal policy, the government is expected to pay approximately US$ 19 billions of this cost as tax credits given to the oil companies after completion of decommissioning activities. In the Gulf of Mexico (GoM), triggered by new US regulations, DecomWorld (2015) estimated decommissioning costs to be approximately US$26 billion. Rogers and Atkins (2015) observed that approximately 50% of the total debt in the oil and gas industry is management's estimated cost of settling decommissioning liabilities. In Nigeria, the multinational oil companies (MOCs) are beginning to divest from Nigerian onshore fields and to sell their equity to local or small independent companies. The Nigerian Vanguard newspaper (2013) reported a rising trend in divestment of onshore fields by MOCs that started in 2009, coming up to an approximately 50% total stake as at 2013. Obviously, to the MOCs, the fields have become less attractive in the face of one or a combination of production, financial, and sociopolitical factors. The local and small independent companies acquiring these fields are not as financially as robust as the MOCs. With the decline in production, there will be less revenue coming from the onshore fields. If the cost of decommissioning is huge, it is probable that the small independent companies may abandon the fields without proper

* Corresponding author. Petroleum Engineering, University of Alaska, Fairbanks, AK 99775-5990, USA.
E-mail address: euafieroho@alaska.edu (E.-O.U. Afieroho).

http://dx.doi.org/10.1016/j.jenvman.2017.08.036
0301-4797/© 2017 Elsevier Ltd. All rights reserved.

decommissioning; and improperly decommissioned facilities will lead to environmental degradation.

Decommissioning and abandonment requirements are not prescriptively stated in Nigeria laws and guidelines, beyond an aspiration to remove facilities at the end of their economic life and according to international best practices (Ibebuike, 2013; West, 2014; Salawu, 2014). Good environmental stewardship will call for all crude oil production facilities to be removed and the environment restored to its preproduction conditions (Ekhator, 2016) or to a better socioeconomic and environmental condition, for current and future stakeholders. This will be the expected sustainable decommissioning and responsible mineral development approach.

While it appears that the dynamics of sustainable development, decommissioning, and end of field life (EOFL) for mineral resources are common observations globally, the sense of the cost of decommissioning liabilities and related discussions is minimal in Nigeria. There may be several contributory factors to this situation, but there should be no acceptable reason for failure to have a publicly accessible cost estimate and plan for decommissioning and associated environmental liabilities in Nigeria, especially the aged onshore crude oil fields.

Ruivo and Morooka (2001) defined decommissioning as "the dismantling, decontamination, and removal of process equipment and facility structures" at the end of a field's economic life. It is a multidiscipline exercise, involving engineering, financial, sociopolitical, environmental, health, and safety disciplines. The terms "abandonment" and "decommissioning" are often used interchangeably, although according to Ayoade (2002), industry operators prefer to use decommissioning, which does not connote voluntary relinquishment in the way abandonment does. In financial reports, some operators describe their decommissioning liabilities as Asset Retirement Obligation (ARO), Decommissioning, Dismantlement, and Restoration (DD&R) or Dismantlement, Removal, and Restoration (DR&R). Smith et al. (2000) and Lawal (2008) noted that there was no recognition of any petroleum-related activities continuing beyond the production phase in Nigeria's Joint Venture (JV) agreements. As further argued by Lawal, this implied that decommissioning was not thought about when the agreements were drafted and signed. Now that the EOFL for these fields is foreseeable, with attendant implications for the revenue and sociopolitical aspects of the nation, quantifying cost implications of decommissioning liabilities, i.e. their dismantlement, removal, and restoration of the environment, has become important.

Accountants and investors like to know the cost of decommissioning liabilities to help them evaluate the sustainability of investment in oil companies. Fields with complicated decommissioning obligations that can cost as much as the anticipated remaining profit from them, will not be attractive to investors. As smaller independent companies that are less financially and technically robust take over operatorship of these fields, the risk of an operator defaulting on its decommissioning liabilities will increase. Compared to the MOCs, they may not have much corporate environmental reputation to uphold, and therefore could easily default. If an operator fails to complete the decommissioning of its facilities, the government, which by extension is the public, will have to pay for the completion of decommissioning of the facilities like the orphan wells programs in the US (Hesson, 2006), or else the environment will be left polluted. In mature fields like the UK Continental Shelf (UKCS), government policy requires operators to remove all assets, unless otherwise approved. Currently under the US Superfund program and also in the UK, all operators that have been associated with an asset at any time in its economic life are held jointly and severally liable for the decommissioning liabilities (West, 2014; Wetmore, 2014). On the contrary, there is no similar explicit policy objective in Nigeria. The new Petroleum Industry Bill is intended to incorporate a similar objective (Dawodu, 2016). However, enforcing it on foreign-parented companies like the MOCs will be difficult, especially after they have divested their assets to local companies and left Nigeria. According to Schaps and George (2017), a court in the UK has held that Shell—an MOC in Nigeria—cannot be taken to a UK court in a dispute over environmental liabilities from its operations in Nigeria. A revised regulatory approach may be required for the decommissioning of crude oil fields in Nigeria. To develop and administer an efficient policy for decommissioning, the cost of meeting decommissioning and its associated environmental liabilities needs to be known by the government and public. From a literature search and to the best of our knowledge, there is no rough order of magnitude (ROM) estimate or any published attempt at generating cost estimates for decommissioning and associated environmental liabilities of onshore crude oil fields in Nigeria. This study seeks to address this knowledge gap. A rough order of magnitude (ROM) cost estimate is a cost estimate prepared at the early stage of a project life cycle when scope definition is very minimal and has a low accuracy range of +50% and −50%. It is not a detail cost estimate and recommended for making high level decisions at the early stage of a project. (PMBOK, 2013). Absence of publicly accessible cost estimates for decommissioning liabilities in Nigeria can be attributed to several factors like low level of public awareness about decommissioning, confidentially of information related to decommissioning, little emphasis on decommissioning phase in the regulatory frameworks etc., (Lawal, 2008; Ibebuike, 2013; SDN, 2015). The research question is therefore: can we get reliable public accessible data to estimate and establish a high-level aggregate cost of decommissioning and associated environmental liabilities from onshore fields in Nigeria? This will help to facilitate discussions and policy development for the decommissioning of onshore fields in Nigeria, events that—contrary to assumptions held by the public—may commence sooner than later.

2. Nigeria and its crude oil production profile

Crude oil fields in Nigeria are generally classified into either offshore fields or onshore fields, as illustrated in Fig. 1. According to NAPIMS (2016), offshore fields are located in the continental shelf of the Atlantic Ocean at water depths of 100 m or deeper. Onshore fields are located on land and shallow waters of less than approximately 100 m deep, which are mainly mangrove swamp locations. Empirical observation of the historical crude oil production profile for Nigeria in Fig. 2 shows the occurrence of two production peaks in 1979 and 2010 similar to the pattern in mature crude oil producing countries like the UK. With a 2015 average daily production of approximately 2.35 MMbopd (BP, 2016), the average annual production decline rate for crude oil in Nigeria is 1%. Crude oil production data published by the government are not broken down

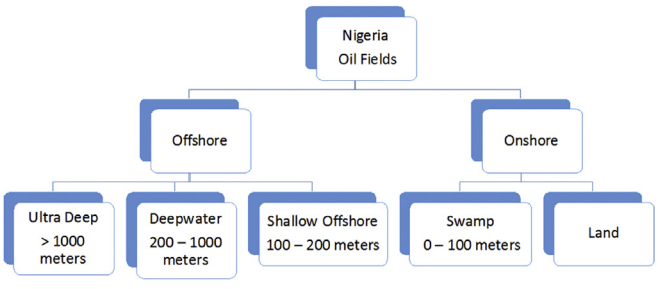

Fig. 1. Nigeria oil field structure.

Download English Version:

https://daneshyari.com/en/article/5116258

Download Persian Version:

https://daneshyari.com/article/5116258

Daneshyari.com