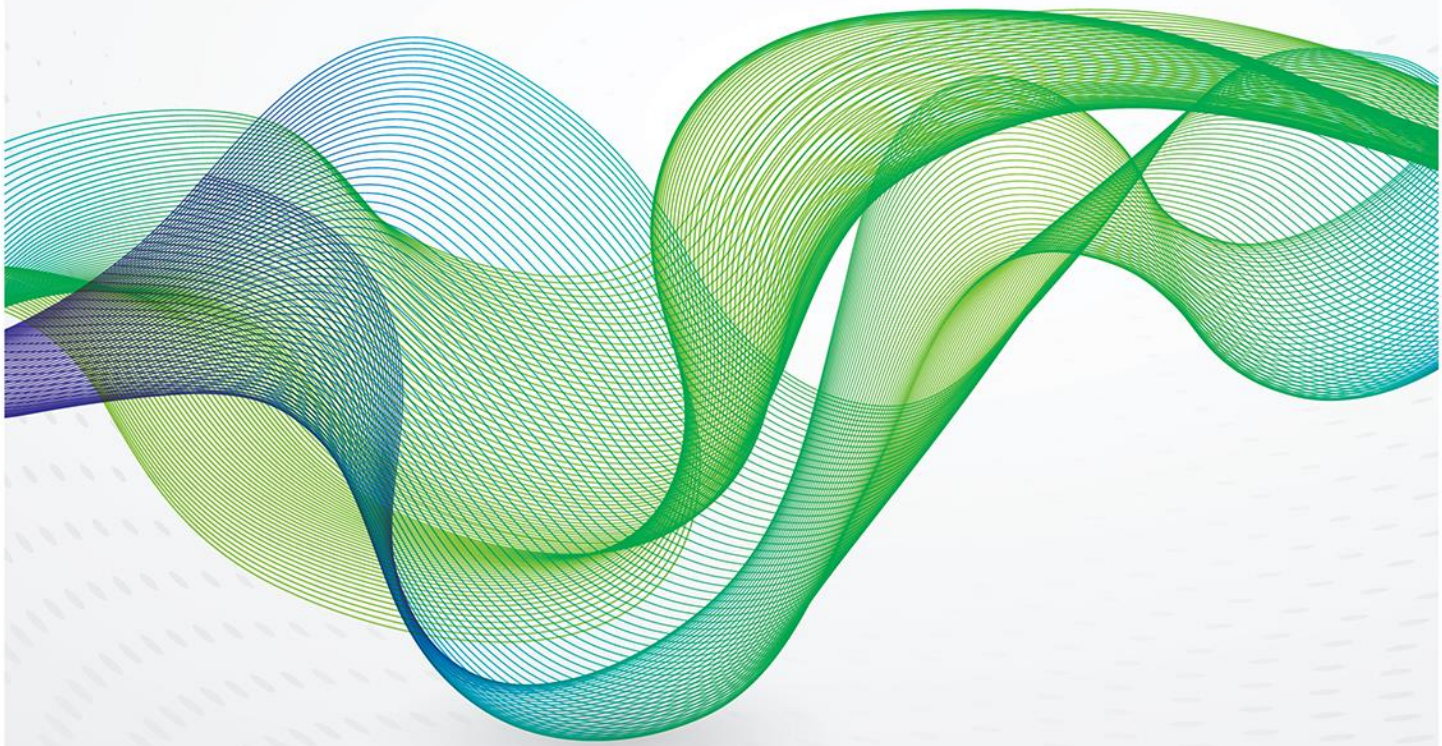
THE OXFORD INSTITUTE FOR ENERGY STUDIES

A RECOGNIZED INDEPENDENT CENTRE OF THE UNIVERSITY OF OXFORD

UNIVERSITY OF OXFORD

April 2018

Ghana's Oil Industry:
Steady growth in a challenging environment



OIES PAPER: WPM 77

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ISBN 978-1-78467-104-4

DOI: https://doi.org/10.26889/9781784671044

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Executive Summary

The West African Republic of Ghana is one of Africa's new oil- and gas- producing nations. Compared to the large African petro-states Angola and Nigeria, Ghana remains a small producer in the Gulf of Guinea with current output at 126 000 barrels of oil per day (bopd). But in contrast to most other producers on the continent, Ghana's industry has advanced at a steady pace in recent years despite a drop in international oil prices. In its first decade, Ghana's petroleum industry has experienced a highly volatile price environment that has remained below US$65/barrel since mid-2015. Yet since the discovery of the Jubilee oil field in 2007, Ghana's industry has seen three offshore projects come onstream. With some of its initial challenges solved, such as the maritime border dispute with Côte d'Ivoire, the industry is expected to retain its position as a key driver of growth in the domestic economy. This is expected to generate revenue for the national government and, as gas production comes onstream, to alleviate a long-standing electricity shortage.

Steady Growth in Ghana's Petroleum Industry

Kosmos Energy discovered commercial quantities of oil and gas in Ghana in 2007. The Jubilee field was developed in less than 3.5 years, reaching first oil in December 2010. This field is positioned in a licence area that has been the site of additional discoveries, and the development of the Greater Jubilee field is underway. The Twenneboa, Enyenra, and Ntomme (TEN) fields came onstream in August 2016, but were initially delayed by a maritime border dispute with Cote d'Ivoire. That dispute was resolved in September 2017 in favour of Ghana, and drilling is now expected to resume. The Sankofa field started production in May 2017, and exploration is projected to start in an adjacent block in 2018, allowing synergies and fast-track start-up if drilling proves successful. Other projects in the Tano licence area were impacted by the maritime border dispute and are expected to resume development shortly. Early 2018 saw the signing of a deal between the government and Exxon Mobil to explore for oil in Ghana's Deepwater Cape Three Points.

Initial Challenges

The first decade of Ghana's new petroleum industry has not been without challenges. It gained international attention when the new government in 2009 started investigating Kosmos Energy and the EO Group on suspicion of corruption. The international companies working in the Jubilee field received a thorough introduction to the political challenges of operating in Ghana. Later, the maritime border dispute between Ghana and Côte d'Ivoire lasted for 3 years and delayed projects in the Tano licence area. Rapid development along an undefined maritime border exacerbated the dispute. While Ghana ultimately secured the rights to the Tano area, an unfavourable result could have very well cost both the country and the operator major investments.

Political Polarization

Ghana has a vibrant democracy, with competitive elections and frequent turnovers in government. Political polarization between the two main political parties, the National Democratic Congress and the New Patriotic Party, led to review and reversal of industry contracts in 2009, resulting in Kosmos Energy negotiating an exit strategy before production started at the Jubilee field. Across political party lines, there is agreement about the need for a strong state presence in the petroleum industry through the Ghana National Petroleum Corporation (GNPC). However, polarization has led to different strategies for developing national petroleum companies, limiting their long-term technical and financial stability.

The Voltaian Basin

The Voltaian Basin covers 40% of Ghana's land mass and is Ghana's most promising site for onshore oil and gas production. The basin has been promoted by GNPC since 2015 and has positive geological preconditions for oil and gas deposits. The current president of Ghana, Nana Akufo-Addo,

has pledged to develop projects in the basin in the next 2 years. However, development of the basin carries significant financial risk, and projects will rely on foreign investment. Discoveries in the basin have inspired promises of prosperity during national political campaigns and have fuelled regional political tension. Current economic systems in the area including fish resources and transportation networks would be impacted by development in the basin. Petroleum activity would further require resettling of entire communities. This makes development significantly more challenging here than in Ghana's offshore projects. Still, there is a potential for oil and gas discoveries, and political will in Ghana to develop the basin.

1. Introduction

The history of Ghanaian petroleum activity can be traced back to the turn of the 20th century. The Tano and Keta Basins had small-scale production in the early 1900s, and the Saltpond field has been operating since the 1970s. However, it was the discovery of the offshore Jubilee field in 2007, with an estimated 700 million barrels of oil (MMbo) and 800 billion cubic feet (Bcf) of gas[1] that put Ghana on the map as a commercial oil and gas producer. Since the Jubilee field reached first oil in 2010, two new projects have been developed in Ghana's offshore waters. The Twenneboa, Enyenra, and Ntomme (TEN) fields (with an estimated 240 MMbo and 396 Bcf of gas)[2] started production in August 2016, and the Sankofa, Gye, and Nyame fields (hereafter Sankofa field) (with an estimated 500 MMbo and 1.45 trillion cubic feet of gas)[3] started production in May 2017. Despite the low price of crude oil since 2014/2015 and a maritime border dispute affecting the Tano blocks, Ghana's petroleum industry has developed at a steady pace. A development plan for the Greater Jubilee field received government approval in October 2017 to start drilling the Mahogany and Teak fields. The Greater Jubilee field is estimated to add 60 MMbo and 100 Bcf of gas to Ghana's production levels.

Ghana has experienced external and domestic macroeconomic shocks since 2012, which led to a decline in economic growth from an average of 10–15 per cent in 2011–2012 to below 5 per cent in 2014 and 2015. The unreliable and low volume of gas imported through the West African Gas Pipeline has forced the country to import oil to generate electricity. The dramatically increased fuel bill and electricity shortages have had a substantial negative impact on the economy.[4] The development of the petroleum industry has been key to reviving growth in Ghana's economy, with the trading of crude oil to gain much-needed foreign exchange and development of the domestic gas industry to help resolve Ghana's electricity shortage.

This paper examines Ghana's petroleum industry, its steady growth, and its initial challenges, such as the maritime border dispute and political interventions. Polarization between the two main political parties in Ghana, the National Democratic Congress (NDC) and the New Patriotic Party (NPP), has had important consequences for the industry. While an internal Ghanaian political dynamic explains particular traits and processes in the industry, the steady pace of growth despite low prices also reflects Ghana's eagerness, across political party lines, to develop the industry in order to support general economic growth.

[1] Tullow Oil (2014), 'Tullow in Ghana': https://www.tullowoil.com/Media/docs/default-source/3_investors/2014-tullow-ghana-report.pdf?sfvrsn=4 (accessed 19 December 2017).
[2] Tullow Oil (2017), 'TEN fields', 9 November: https://www.tullowoil.com/operations/west-africa/ghana/ten-field (accessed 19 December 2017).
[3] Eni (2017), 'Eni starts production from the OCTP Integrated Oil&Gas Development Project, in Ghana's offshore, ahead of schedule and with a record time-to-market', 20 May: https://www.eni.com/en_IT/media/2017/05/eni-starts-production-from-the-octp-integrated-oilgas-development-project-in-ghanas-offshore-ahead-of-schedule-and-with-a-record-time-to-market (accessed 19 December 2017).
[4] World Bank (2015), 'Ghana: Sankofa Gas Project', 7 November: http://documents.worldbank.org/curated/en/173561467986250592/Ghana-Sankofa-Gas-Project (accessed 27 October 2017).

2. Steady Growth in Ghana's Petroleum Industry

Lower international oil prices in recent years have caused slowdowns in petroleum industries across the globe. Ghana, however, has not faced a strong downturn. Two new oil and gas projects have come onstream since production started at the Jubilee field in 2010, with current production levels at 126 000 bopd (Jubilee field 31 000 bopd, TEN fields 50 000 bopd, and Sankofa field 45 000 bopd). Technical challenges in the Jubilee field resulted in a lower average for 2017 (production peaked at 115 000 bopd in 2013), severely impacting Ghana's overall production level. Now that there has been a favourable result for Ghana in a maritime border dispute with Côte d'Ivoire, the TEN fields are expected to produce around 80 000 bopd, and there are positive prospects for further development in the Tano blocks, where discoveries have already been made.[5] Ghana's third offshore oil and gas project, the Sankofa field, contributes to the steady growth of the industry, increasing oil production and substantially contributing to growth in the domestic gas industry. When the technical challenges of the Jubilee field are solved, the three offshore projects have the potential to raise Ghana's production level in the next few years to over 300 000 bopd.[6]

Ghana has four petroleum basins (Figure 1). The Western Basin, currently the most active, includes the Tano and Cape Three Point blocks. The Jubilee field straddles Tano and Cape Three Points, the TEN fields are located in Tano, and the Sankofa field is located in Cape Three Points. The Central Basin is home to Ghana's longstanding Saltpond field. The Eastern Basin includes both Accra and Keta blocks, where exploration has been carried out without much commercial result to date. Lastly, the Voltaian Basin covers 40 per cent of Ghana's land mass and is Ghana's most promising site for onshore petroleum extraction.[7]

Figure 1: Ghana's Four Sedimentary Basins

Source: Eni 2018

Note: Not to be reproduced or copied without written permission from Eni

[5] See Hess (2017), 'A focused, resilient portfolio': http://www.hess.com/operations/operations-map (accessed 11 October 2017).

[6] See *Oil and Gas Journal* (2016), 'Ghana seen producing 350 000 b/d in 2018', 3 November 2016: http://www.ogj.com/articles/2016/11/ghana-seen-producing-350-000-b-d-in-2018.html (accessed 19 December 2017).

[7] Petroleum Commission (2017), 'Sedimentary basins': http://www.petrocom.gov.gh/sedimentary-basins.html (accessed 29 October 2017).

The Discovery and Development of the Jubilee Field

In June 2007, Kosmos Energy, a small American exploration company, announced that commercial quantities of oil and gas had been found in Ghana. The president of Ghana was quoted in Ghanaian and international media stating, 'Even without oil, we are doing so well. . . . With oil as a shot in the arm, we're going to fly.'[8] The country experienced a Jubilee euphoria, and the World Bank adjusted its growth projections for the Ghanaian economy. The international community warned about the 'resource curse' and urged the country to take the time to develop a proper regulatory framework.[9] However, companies and politicians in Ghana moved forward with developments rapidly.

The Jubilee field has an estimated 700 MMbo and 800 Bcf of gas. The field was brought to production in less than 3.5 years. It is located 60 km offshore of Ghana's Western Region, with a water depth of 1100–1700 m. It was declared a world-class reservoir with large accumulations of light sweet crude oil after the Mahogany-1 and Hyedua-1 wells were drilled. The Mahogany-2 and Hyedua-2 wells confirmed that the Jubilee field was highly productive and well connected. In July 2009, the government of Ghana approved the Phase 1 development plan and unitization agreement,[10] including the commissioning of a floating production storage and offloading (FPSO) production unit. The FPSO was named after Ghana's first president, Kwame Nkrumah. First oil was achieved on 15 December 2010 and celebrated with a lavish ceremony.

The Jubilee field was initially managed by a joint venture consisting of Tullow Oil Ghana (the operator) and technical partners GNPC, Anadarko, Sabre Oil and Gas, and the EO Group. Changes were made in the consortium in 2009, when the new government investigated accusations of corruption against the EO Group and Kosmos Energy. Sabre Oil and Gas sold their Jubilee share to the South African national petroleum company Petro SA, a transaction that also produced corruption allegations in South Africa and Ghana.[11] Currently, the Jubilee partners are Tullow Oil Ghana (35.48%), Kosmos Energy (24.08%), Anadarko (24.08%), GNPC (13.64%), and Petro SA (2.73%).

Production in the Jubilee field experienced a significant setback in February 2016 when the turret-bearing of the FPSO began to malfunction. As a consequence, production amounts below the optimal projection (110 000 bopd) were expected for 2017, 2018, and 2019.[12] The crude oil from the Jubilee field is exported to Europe, while the gas is transported via pipeline to Ghana's onshore gas processing plant in Atuabo.

Continued Growth in the Offshore Industry

While the Jubilee field is Ghana's first and so far largest project, several new projects have increased Ghana's production capacity (Figure 2). The TEN fields are located 20 km west of the Jubilee field. The TEN fields became Ghana's second major offshore oil and gas production project with first oil in August 2016. The reservoir was discovered in March 2009 with the successful drilling of the

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[8] *BBC* (2007) "UK's Tullow uncovers oil in Ghana", 18 June 2007: http://news.bbc.co.uk/1/hi/business/6764549.stm (accessed 15 September 2017).

[9] Moss, T. and Young, L. (2009), 'Saving Ghana from its oil: The case for direct cash distribution', Working Paper 186, Centre for Global Development; Manteaw, S. (2010), 'Ghana's EITI: Lessons from mining and policy implications for oil', *Ghana Policy Journal,* 4, 96–109; Gyampo, V. and Edward, R. (2011), 'Saving Ghana from its oil: A critical assessment of preparations so far made', *Africa Today*, 57(4), 48–69.

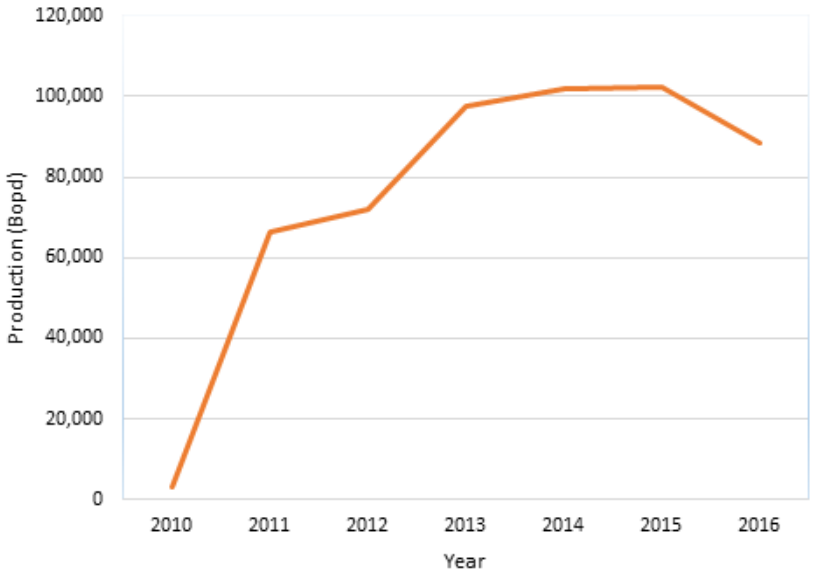
[10] Unitization is the combination of multiple wells to produce from a specified reservoir.

[11] See Reuters (2013), 'South Africa police investigate PetroSA over alleged graft', 26 April: http://www.reuters.com/article/us-safrica-petrosa/south-africa-police-investigate-petrosa-over-alleged-graft-idUSBRE93P0J020130426 (accessed 1 October 2017).

[12] See Tullow Oil (2017), 'Jubilee field', 24 June: https://www.tullowoil.com/operations/west-africa/ghana/jubilee-field (accessed 3 October 2017).

Twenneboa-1 well in the Tano licence area. The TEN fields have an estimated 240 MMbo and 396 Bcf of gas, and averaged production of 56 000 bopd in 2017.[13]

Figure 2: Annual Production of Crude Oil (2010–2016)



Source: GNPC statistics (2017) http://www.gnpcghana.com/fo_reports.html (Accessed 1 December 2017)

The TEN fields are connected by subsea infrastructure to the Jubilee field, which aids the transportation of gas to Atuabo Gas Processing Plant. The fields are operated by Tullow Oil Ghana (47.18%) with partners Kosmos Energy (17%), Anadarko (17%), GNPC (15%), and Petro SA (3.82%). Much like the Jubilee field, the TEN fields were developed rapidly and on budget, using an FPSO.[14] The first 6 months of production saw approximately 10 000 bopd less than projected at only 14 000 bopd. This low average was due to challenges with reservoir performance and the drilling limitation set by the International Tribunal for the Law of the Sea (ITLOS). As the border dispute was resolved in 2017, Tullow have stated their intention to continue drilling to reach the FPSO's designed capacity of 80 000 bopd.

The Sankofa field, also called the Offshore Cape Three Points Integrated oil and gas development project, is Ghana's latest offshore oil and gas project; the field is estimated to contain 500 MMbo and 40 billion cubic meters of gas. The Offshore Cape Three Points licence area is located to the east of the Jubilee field in the Cape Three Points block. This area has recently been estimated to contain 500 MMbo and 40 million cubic meters of gas. First oil was achieved in May 2017, 3 months ahead of schedule. The field is operated by Eni (44.44%) with partners Vitol (35.56%) and GNPC (20%). In addition to the production in the Sankofa field, Eni has obtained a new exploration licence in the Cape Three Points area. The new block is located adjacent to the current block. Exploration is projected to start in 2018 while drilling continues in the Sankofa field. If drilling proves successful in the new licence area, the location allows for synergies and a fast-track start-up.[15]

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[13] See Tullow Oil (2016), 'TEN project': https://www.tullowoil.com/Media/docs/default-source/operations/ten-project-brochure-july-2016-web-spreads.pdf?sfvrsn=4 (accessed 29 September 2017).
[14] See Tullow Oil (2016), 'TEN project': https://www.tullowoil.com/Media/docs/default-source/operations/ten-project-brochure-july-2016-web-spreads.pdf?sfvrsn=4 (accessed 29 September 2017).
[15] Eni (2017), 'Eni starts production from the OCTP Integrated Oil&Gas Development Project, in Ghana's offshore, ahead of schedule and with a record time-to-market', 20 May: https://www.eni.com/en_IT/media/2017/05/eni-starts-production-from-the-octp-integrated-oilgas-development-project-in-ghanas-offshore-ahead-of-schedule-and-with-a-record-time-to-market (accessed 3 September 2017).

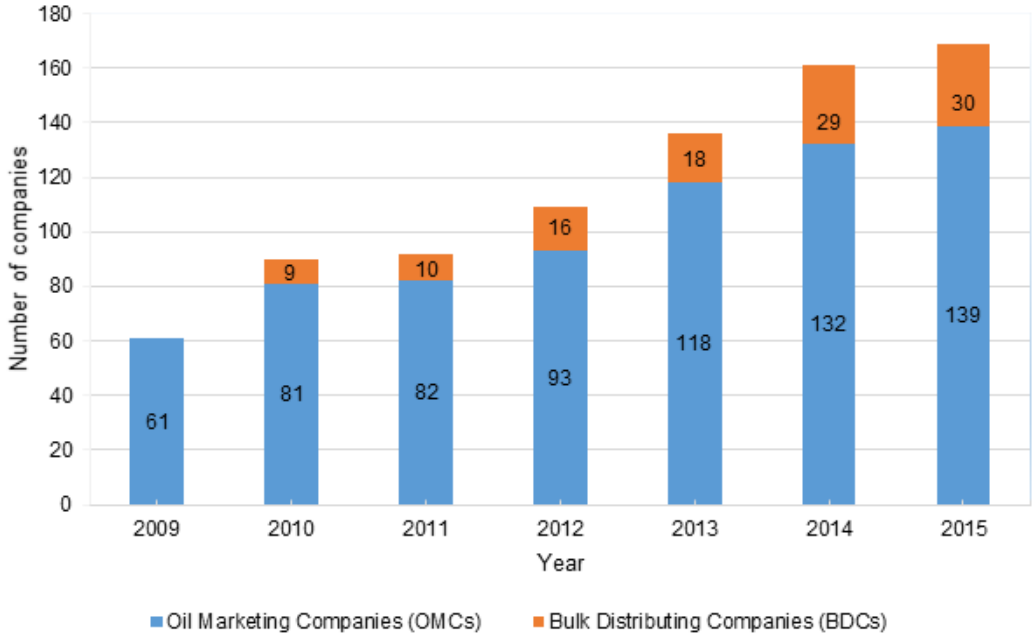
Gas from the Offshore Cape Three Points development project was expected to flow in the first quarter of 2018. The project will be connected to onshore receiving and processing facilities in Sanzule and transported to Ghana Gas. The gas facility is expected to add 180 million standard cubic feet of gas per day to the national electricity grid. A Sanzule onshore facility is scheduled for completion in 2018.[16] The World Bank provided loans and financial guarantees for the Sankofa gas project to ensure its timely development because of its major contribution to Ghana's electricity sector and the ripple effects of such developments for the wider economy.[17]

The latest development in the industry is the entrance of Exxon Mobil to search for hydrocarbons in the Deepwater Cape Three Points. The deal, which is yet to be ratified by parliament, was reached through direct negotiations and was the first to be signed after the resolution of the maritime border dispute, which had halted oil and gas projects in Ghana.[18]

Growth in the Downstream Industry

The downstream industry has had a handful of participants, including state-owned companies and international oil companies, since Ghana's independence in 1957. In the 2000s, the sector saw a withdrawal of major oil companies (excluding Total) and an expansion of Ghanaian and African companies. In 2005, the government embarked on a deregulation reform, which made it easier for private companies to participate in import, distribution, and marketing of petroleum products. Ghana's downstream industry transformed in the span of a decade to include a plethora of private companies. In 2014, there were 132 oil-marketing companies and 29 import companies (Figure 3).[19]

Figure 3: Growth in the Number of Registered Downstream Companies (2009–2015)



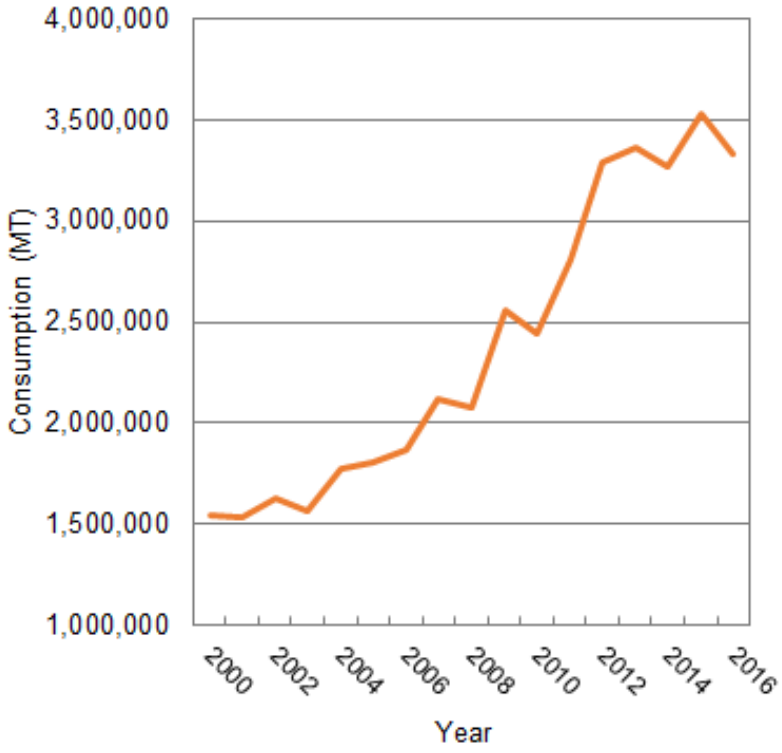
Source: National Petroleum Authority Statistics (2016) 'Downloads': http://www.npa.gov.gh/downloads (accessed 3 September 2017).

[16] TechnipFMC (2017), 'TechnipFMC awarded an onshore contract in Ghana', 21 March: https://www.technipfmc.com/en/media/press-releases/technipfmc-awarded-an-onshore-contract-in-ghana (accessed 3 September 2017).
[17] World Bank (2015), 'Ghana: Sankofa Gas Project', 7 November: http://documents.worldbank.org/curated/en/173561467986250592/Ghana-Sankofa-Gas-Project (accessed 27 October 2017).
[18] Reuters (2018), 'Exxon Mobil signs deal for deepwater oil exploration off Ghana', https://www.reuters.com/article/us-ghana-oil/exxon-mobil-signs-deal-for-deepwater-oil-exploration-off-ghana-idUSKBN1F7147 (accessed 2 February 2018).
[19] National Petroleum Authority (2017), 'Downloads': http://www.npa.gov.gh/downloads (accessed 3 September 2017).

The reform was initiated in 2005, but the substantial growth in Ghana's downstream sector was largely driven by the discovery of oil and gas. The National Petroleum Authority was established to regulate and oversee the liberalization of the industry. The government of Ghana launched a credit scheme to boost the sale of petroleum products and offered favourable terms to encourage import companies and transportation ventures. The reform led to the erection of many new service stations across the country and formalized much of the downstream market. It did not, however, succeed in phasing out petroleum product subsidies—as was planned but, unsurprisingly, proved politically challenging.[20]

Ghana's oil refinery, built in 1963, has a refining capacity of 45 000 bpsd (barrel per stream day). The refinery got a 14 000 bpsd residual fluid catalytic cracker after a South Korean development project provided several new components to the refinery plants in the late 1990s. However, beset by financial difficulties, the refinery has not processed any domestically produced crude oil to date. Ghana has the second largest domestic market for petroleum products in West Africa (after Nigeria), which consumed 3.5 million metric tons (MT) of petroleum products in 2016. Ghana further supplies petroleum products to markets in Burkina Faso, Togo, and Côte d'Ivoire (Figure 4). The current liberalization and growth of the downstream sector positions it as a potential future supplier of petroleum products to the West African region.

Figure 4: Growth in Petroleum Product Consumption (2000–2016)



Source: National Petroleum Authority Statistics (2017) 'Downloads': http://www.npa.gov.gh/downloads (accessed 3 September 2017).

[20] Laan, T., Beaton, C., and Bertille, P. (2010), 'Untold billions: Fossil-fuel subsidies, their impacts and the path to reform', in *Strategies for Reforming Fossil Subsidies: Practical Lessons from Ghana, France and Senegal*, Geneva: Global Subsidies Initiative; Lindebjerg, E. S., Peng, W., and Yeboah, S. (2015), 'Do policies for phasing out fossil fuel subsidies deliver what they promise? Social gains and repercussions in Iran, Indonesia and Ghana', UNRISD Working Paper 1. https://www.files.ethz.ch/isn/186871/Lindebjerg%20et%20al.pdf (Accessed 10 October 2017): Bacon, R. and Kojima, M. (2006), 'Coping with higher oil prices', Report 323/06, Washington, DC: Energy Sector Management Assistance Program and World Bank.

Regulatory Context

According to the 1992 Constitution, all petroleum resources are vested in the president of Ghana. Chiefs, families, and individuals retain some surface and subsurface rights that can entitle them to compensation for their land. But the minerals are vested in the president, and parliament has to ratify all petroleum agreements. The three successful and timely offshore projects developed in Ghana's upstream industry are testaments to Ghana's eagerness and competence in developing hydrocarbon resources in cooperation with international oil companies.

Since production started in the Jubilee field, the regulatory framework for the upstream industry has received an overhaul.[21] The new regulatory framework has clarified the roles of institutions in the sector and made significant advancements towards transparency. One of the new laws, the Petroleum Commission Act of 2011, established the Petroleum Commission as the regulator of all upstream petroleum activities. There have been reports, however, that the Petroleum Commission lacks autonomy and is bypassed by the Ministry of Energy in decision-making, particularly when new petroleum agreements are signed.[22]

Another of the new laws, the Petroleum Exploration and Production Act of 2016, is a considerable effort towards transparency in the industry and established Ghana's Hybrid Petroleum Agreements. The Act stipulates an open and competitive tender process for acquisition of petroleum licences. However, the Minister of Energy has the right to circumvent the bidding process and enter direct negotiations. The Hybrid Petroleum Agreements offer a great deal of flexibility in blending of licencing procedures, royalty payments, and product sharing. As such, they form a tax- and royalty-based system with minority state participation (the state is represented by GNPC, which holds a 10–15% share). To date, all petroleum agreements in Ghana have been granted through direct negotiation.[23]

[21] When commercial quantities of oil and gas were discovered in 2007, Ghana's regulatory framework for the upstream industry relied on a few acts that were established during Jerry Rawlings's military regime in the 1980s. The laws governing the upstream petroleum industry were the Ghana National Petroleum Corporation Act 1983 (PNDC Law 64), Petroleum Exploration and Production Act 1984 (PNDC Law 84), and Petroleum Income Tax Law 1987 (PNDC Law 188). This regulatory regime has been replaced by the Petroleum Commission Act 2011 (Act 821), the Petroleum Exploration and Production Act 2016 (Act 919), Petroleum Revenue Management Act 2011 (Act 815), and the Petroleum Revenue Management (Amendment) Act 2015 (Act 893). See *Oil and Gas Law Review* (2016), 'Ghana', December: http://thelawreviews.co.uk/edition/the-oil-and-gas-law-review-edition-4/1140329/ghana (accessed 27 October 2017).

[22] Hickey, S., Abdulai, A. G., Izama, A., and Mohan, G. (2015), 'The politics of governing oil effectively: A comparative study of two new oil-rich states in Africa', Effective States and Inclusive Development Working Paper No. 54. http://www.effective-states.org/wp-content/uploads/working_papers/final-pdfs/esid_wp_54_hickey_abdulai_izama_mohan.pdf (accessed 10 December 2017)

[23] Ndi, G. (2017), 'Act 919 of 2016 and its contribution to governance of the upstream petroleum industry in Ghana', *Journal of Energy and Natural Resource Law*,36(1): 1–27.

3. Initial Challenges

While Ghana's petroleum industry has enjoyed steady growth, the first decade was not without challenges. The corruption investigations of Kosmos Energy and the maritime border dispute with Côte d'Ivoire stand out as examples of the consequences of the speedy development of the industry.

Political Intervention: Kosmos Energy in Troubled Waters

Since the discovery of the Jubilee field in 2007, Kosmos Energy has had an uneasy experience in Ghana's new petroleum industry. The change in government from the NPP to NDC in 2008 led to corruption investigations into Kosmos's entry to Ghana through its relationship with the EO Group, a Ghanaian petroleum company. Both the Ghanaian government and the US Department of Justice were involved in the criminal investigations.

Kosmos is a US exploration company based in Dallas. It was established in 2003 by the previous management of Trinton Energy, with Jim Musselman in charge.[24] Charles Owusu and Kwame Bawuah-Edusei, two Ghanaian nationals living in the United States, founded the EO Group, which contacted Kosmos and proposed exploration in Ghana's offshore waters. As such, the EO Group initiated Kosmos's entrance into Ghana and directed its attention to the Cape Three Point block in the Western Basin. In return, the EO Group received a 3.5 per cent stake in the Jubilee field. Kosmos also intended to cover the initial cost for the EO Group to participate in exploration and development.[25]

The individuals in the EO Group had close political connections with the NPP government and mediated the relationship with Kosmos. Owusu became Kosmos's country representative in Ghana. Kosmos had courted a good relationship with the political party in power in Ghana, and as such took a large risk with regards to the party political system. In December 2008, the NPP lost the presidential election to the NDC, and in January 2009 John Atta Mills was inaugurated as the new president of Ghana. A police investigation was launched into the relationship between the EO Group and government officials. In addition to misuse of political connections, accusations of forging signatures and documents were made. The police questioned all the Jubilee partners, and there was a government order to the Bank of Ghana to freeze accounts for Kosmos and affiliated individuals.[26]

Political intervention was to be expected in Ghana with a change of government. However, international continuance gave the investigations further momentum. In October 2009, Anadarko filed a complaint about Kosmos's compliance under the Foreign Corrupt Practices Act at the US Department of Justice for possible violations in connection with securing licensing, exploration, and production agreements.[27] Anadarko had been working with Kosmos since the start of developing the Jubilee field.

Kosmos then fired Owusu as its country representative in Ghana. In October 2009, Kosmos confirmed plans to sell its stake in the Jubilee field, worth an estimated US$4 billion, to ExxonMobil. GNPC had previously expressed interest in Kosmos's Jubilee shares. However, with no proposal forwarded by the GNPC, Kosmos went ahead with negotiations with ExxonMobil. The government of Ghana announced that it would not approve Kosmos's sale of the Jubilee shares.[28]

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[24] Kosmos was established with backing from the private equity groups Warburg Pincus and the Blackstone Group.
[25] Boynton, R. (2013), 'Big men: Everyone wants to be big' [video documentary]: http://bigmenthemovie.com (accessed 8 October 2017).
[26] See *Wikileaks* (2009), 'Ghana: Kosmos energy update', 18 December: https://wikileaks.org/plusd/cables/09ACCRA1339_a.html (accessed 27 October 2017).
[27] Boynton, R. (2013), 'Big men: Everyone wants to be big' [video documentary]: http://bigmenthemovie.com (accessed 8 October 2017).
[28] See *New York Times* (2016), 'Kosmos confirms sale of oil stake', 12 October: http://www.nytimes.com/2009/10/13/business/energy-environment/13oil.html (accessed 10 October 2017).

Kosmos claimed that this was purposefully done because GNPC wanted to acquire Kosmos's shares for a cheaper price. There were also theories circulating about Anadarko's involvement with the NDC government in order to gain a larger share of the Jubilee field.[29] As is sometimes the case in Ghana (and the international oil industry), distinguishing rumours and conspiracies, including those regarding Anadarko and the NDC, from facts can be challenging. The transition in government and the high stakes in the new petroleum industry created unexpected problems for Kosmos. Trying to save the company's reputation and distance itself from the corruption accusations, Kosmos's board of directors removed Musselman. With the two original front men of the Jubilee discovery, Musselman and Owusu, out of the picture, Kosmos amended its relationship with the Ghanaian government.[30]

In August 2010, Kosmos stated that they would not sell their Jubilee shares to ExxonMobil or anyone else and instead would continue with offshore exploration and development with the Jubilee partners. In December 2010, the Ghanaian government and Kosmos signed a truce agreement.[31] The US Department of Justice stated in April 2011 that it would not take action in regards to Kosmos and the EO Group.[32]

Party-political polarization has been common since Ghana's latest turn to democracy in 1992. The two political parties constantly accuse each other of corruption, review contracts, and in some cases prosecute individuals that they find have engaged in corrupt practices. Since the Jubilee field plays a major role in the Ghanaian economy, and oil and gas (including future discoveries) are expected to fuel Ghana's economic development, successful management of the petroleum industry will provide any political party in Ghana with legitimacy and strengthen its political reputation in future elections. Speculation remains on whether any corruption actually took place during Kosmos's entry into Ghana, but close relationships between government officials and any investor entering Ghana's industry will almost certainly be scrutinized when there is a change in government.

Maritime Border Dispute: Ghana versus Côte d'Ivoire

The maritime border dispute between Ghana and Côte d'Ivoire resulted from a long-term disagreement regarding the direction of the azimuth line dividing the two countries' territorial waters, exclusive economic zones, and portions of the continental shelf. The TEN fields, developed by Tullow Oil Ghana, are located in Ghana's Western Basin on the border with Côte d'Ivoire—an area that Côte d'Ivoire in September 2011 claimed as part of its exclusive economic zone.

After a series of bilateral negotiations that did not yield meaningful results, Ghana turned to the International Tribunal of the Law of the Sea (ITLOS) in November 2014. The Ghanaian government asked the tribunal to determine the precise geographical coordinates of the maritime boundary between the two countries.[33] The Ghanaian government argued that there had always been a tacit

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See *Washington Times* (2010), 'ExxonMobil pulls out of $4.5 billion Ghana deal', 18 August: http://www.washingtontimes.com/news/2010/aug/18/exxonmobil-pulls-out-of-45-billion-ghana-deal/ (accessed 10 October 2017).

[29] See Modern Ghana (2010), 'Anadarko's romance with Tsikata exposed', 8 March: https://www.modernghana.com/news/266758/anadarkos-romance-with-tsikata-exposed.html (accessed 10 October 2017).

[30] Boynton, R. (2013), 'Big men: Everyone wants to be big' [video documentary]: http://bigmenthemovie.com (accessed 8 October 2017).

[31] See *Financial Times* (2010), 'Ghana and Kosmos sign truce agreement', 15 December: https://www.ft.com/content/bb643772-0d2e-11e0-82ff-00144feabdc0 (accessed 18 October 2017).

[32] See Reporting Oil and Gas (2011), 'US Justice Dept. declines bribery enforcement action against Kosmos in Ghana', 27 April: http://www.reportingoilandgas.org/us-justice-dept-declines-bribery-enforcement-action-against-kosmos-in-ghana/ (accessed 18 October 2017).

[33] See International Tribunal for the Law of the Sea (2017), 'Dispute concerning delimitation of maritime boundary between Ghana and Côte d'Ivoire in the Atlantic Ocean', 23 September: https://www.itlos.org/fileadmin/itlos/documents/cases/case_no.23_merits/C23_Judgment_23.09.2017_corr.pdf (accessed 23 September 2017).

agreement regarding the location and direction of the maritime boundary. As such, Ghana wanted ITLOS to affirm the customary equidistance boundary as the two countries' maritime border. Ghana presented the records of oil concessions, seismic surveys, and exploration and drilling activities from both Ghana and Côte d'Ivoire to demonstrate the use of the boundary for approximately 50 years.[34]

Tullow Oil, operator of the TEN fields, submitted a statement to the Tribunal explaining their operations in Côte d'Ivoire since 1997 and involvement in several projects in the country. Tullow used its Ivorian experience to support the government of Ghana's claim about the consistent use of the maritime border that placed the TEN fields on the Ghanaian side. Tullow referred to the presentations and maps produced by the Ivorian national oil company, Petroci, which showed no overlap between Ghana's blocks and Côte d'Ivoire's blocks.[35]

Côte d'Ivoire maintained that the maritime boundary between the two countries was still to be delimited, as there had been no formal or tacit agreement on it. Côte d'Ivoire argued that there had only been four drilling operations in the disputed area, to which Côte d'Ivoire had made clear objections. The maps provided by Ghana were discounted by Côte d'Ivoire as not authoritative. They pointed out that international courts and tribunals have been reluctant to treat oil practice as proof of the existence of a maritime boundary. Côte d'Ivoire further pointed out that Petroci was a commercial entity and was not mandated to establish maritime boundaries on behalf of the state. Côte d'Ivoire asked ITLOS to declare that the activities carried out by Ghana had violated Côte d'Ivoire sovereign rights over its continental shelf and to facilitate compensation payments for the damages resulting from that violation. [36]

The tribunal made an interim ruling in April 2015 that Tullow and Ghana could continue to develop the TEN fields, under the condition that no new wells would be drilled in the disputed area.[37] In its final judgment on 23 September 2017, the tribunal rejected Ghana's claim that there had been a tacit agreement between the two countries that constituted the delimitation of the maritime border. It ruled, however, that the single maritime border between the two countries started at the landmark BP 55+ (Figure 5). The border that the tribunal determined placed the TEN fields on the Ghanaian side. Therefore, the tribunal found that Ghana did not violate Côte d'Ivoire's exclusive sovereign rights and that the TEN fields were in Ghana's exclusive economic zone.[38]

While the 3-year-long border dispute at ITLOS was eventually resolved in Ghana's favour, the case demonstrates the lack of preparedness and technical expertise of the mandated institutions in Ghana. It further demonstrates the initial rush of development in the industry for both the Jubilee and TEN fields. The financial losses to both Ghana and Tullow would have been severe if the tribunal had ruled

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[34] One of the examples that Ghana presented was that of Phillips Oil, which had acquired concessions in the disputed area from both countries in the late 1970s. The eastern limit of Phillips's concession in Côte d'Ivoire coincided with the western limit of its concession in Ghana. The Ivorian acceptance of the boundary for the Phillips project and the silence of Côte d'Ivoire on previous activities, including surveying and drilling in the disputed area, were, according to Ghana, proof that there was an existing border that had been respected by both parties. See International Tribunal for the Law of the Sea (2015), 'Memorial of Ghana', 4 September: https://www.itlos.org/fileadmin/itlos/documents/cases/case_no.23_merits/pleadings/Memorial_of_Ghana_Vol._I.pdf (accessed 20 October 2017).

[35] International Tribunal for the Law of the Sea (2015), 'Statement of Paul McDade on behalf of Tullow Oil plc', 18 March: https://www.itlos.org/fileadmin/itlos/documents/cases/case_no.23_prov_meas/Volume_III/S-TOL/Statement_of_Tullow__18_Mar._2015___S-TOL__.pdf (accessed 20 October 2017).

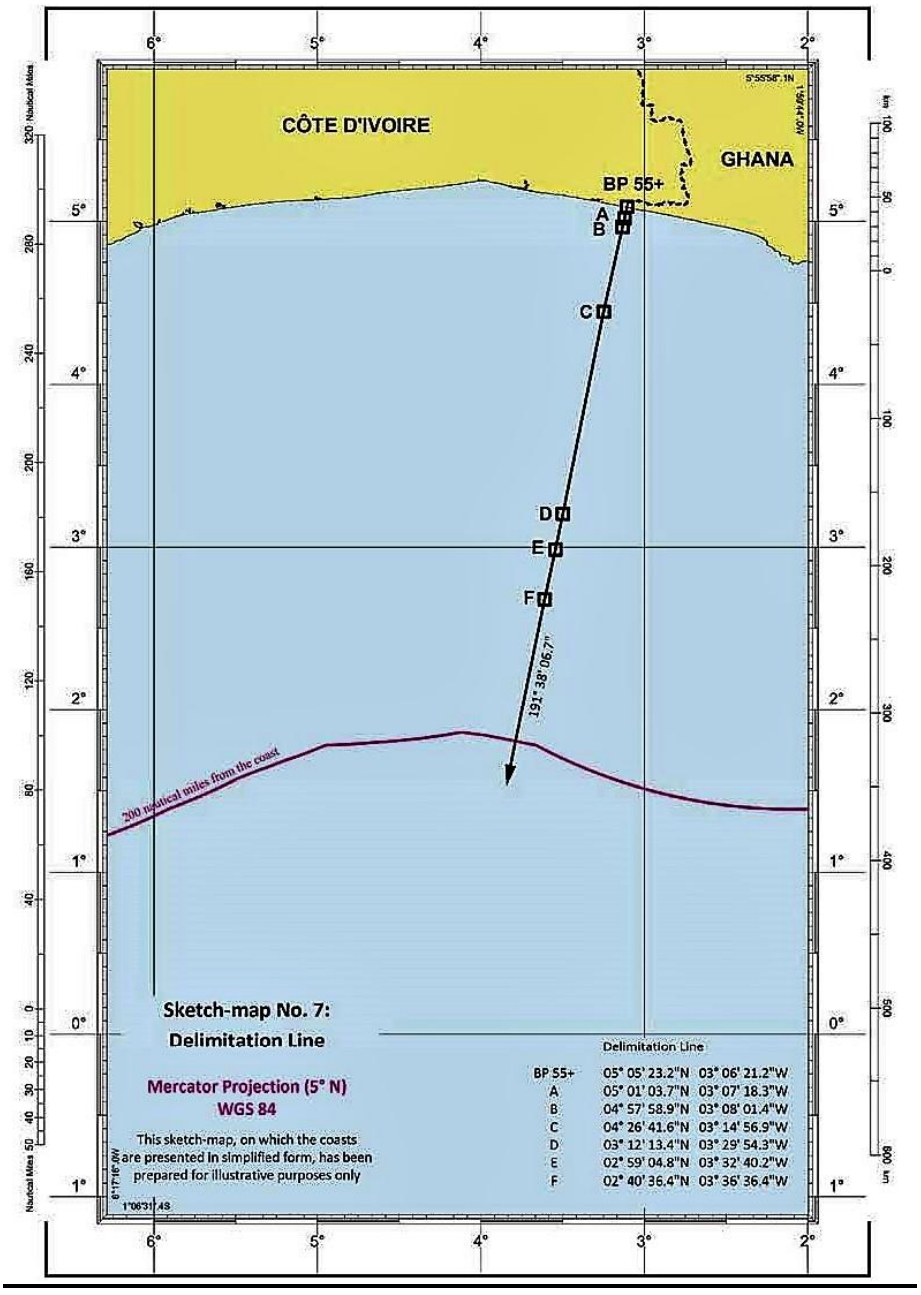
[36] International Tribunal for the Law of the Sea (2016), 'Counter memorial by Côte d'Ivoire', 4 April: https://www.itlos.org/fileadmin/itlos/documents/cases/case_no.23_merits/pleadings/Counter_Memorial_final_Vol.I_Eng_TR.pdf (accessed 20 October 2017).

[37] *The Economist* (2015), 'Tribunal issues interim verdict on border dispute', 30 April: http://country.eiu.com/article.aspx?articleid=2023125786&Country=Ghana&topic=Economy&subtopic=Forecast&subsubtopic=Economic+growth&u=1&pid=1243436508&oid=1243436508&uid=1 (accessed 20 October 2017).

[38] International Tribunal for the Law of the Sea (2017), 'Dispute concerning delimitation of maritime boundary between Ghana and Côte d'Ivoire in the Atlantic Ocean', 23 September: https://www.itlos.org/fileadmin/itlos/documents/cases/case_no.23_merits/C23_Judgment_23.09.2017_corr.pdf (accessed 23 September 2017).

in favour of Côte d'Ivoire. The border dispute should hopefully lead to the demarcation of the remaining borders between Ghana and its neighbours. Oil and gas explorations to the east risk claims to land by Togo, as the borders have not officially been demarcated.[39]

Figure 5: Maritime Boundary after the ITLOS Ruling



Source: International tribunal (2017) 'Press Release 264' 23 September: https://www.itlos.org/fileadmin/itlos/documents/press_releases_english/PR_264_EN.pdf (Accessed 7 March 2018).

[39] See CitifmOnline (2017), 'Demarcate Ghana-Togo border to prevent future disputes—Surveyors' 25 September: http://citifmonline.com/2017/09/25/demarcate-ghana-togo-border-to-prevent-future-disputes-surveyors/ (accessed 22 October 2017).

4. Political Polarization

The two largest political parties in Ghana, the NDC and the NPP, have been rivals since the inception of Ghana's Fourth Republic in 1992. Before 1992, the military leader Jerry Rawlings led Ghana under Provisional National Defence Council from 1981 to 1992. Rawlings won the 1992 election. Changes in government since then are summarized in Table 1.

Table 1: Elected Governments in Ghana's Fourth Republic

Election year	Victorious party	President
1992	National Democratic Congress	Jerry Rawlings
1996	National Democratic Congress	Jerry Rawlings
2000	New Patriotic Party	John Kufour
2004	New Patriotic Party	John Kufour
2008	National Democratic Congress	John Atta-Mills[a]
2012	National Democratic Congress	John Mahama
2016	Newl Patriotic Party	Nana Akufo-Addo

[a] John Atta-Mills died in office in 2012.

While Ghana has been praised for its peaceful turnover of governments, the period of transition always entails changes in economic policy and replacement of key personnel in state-owned enterprises. Entrepreneurs and business owners who have had favourable contracts, access, or positions with the previous government have to adjust to the new regime.

Ghana National Petroleum Corporation

The Ghana National Petroleum Corporation (GNPC) has been an integral part of Ghana's petroleum industry since its establishment in 1983.[40] The positions in GNPC, particularly the role of chief executive, have always been allocated to people close to the president and are seen as some of the most prestigious roles in government. Tsatsu Tsikata served as chief executive from 1988 to 2000, but after the NPP came to power he was convicted of misappropriating state funds.[41] He was released from prison, with his conviction overturned, after the NDC returned to power in 2008.

While in power between 2001 and 2008, the NPP initiated major structural changes to the petroleum industry, including GNPC. The close ties between GNPC and the Rawlings government increased incentives for the NPP to restructure the entire corporation. Downsizing led to 9 out of 10 GNPC employees being removed.[42] Private capital was injected, and the GNPC was transformed into a commercial upstream operator in 2002. NPP removed GNPC's regulatory mandate for both upstream and downstream sectors.

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[40] The 1983 GNPC law was modelled with technical assistance from Brazil's national oil company, Petrobras, which established GNPC as the industry regulator and a commercial entity. While the NDC and the NPP employ different strategies for the development of GNPC, there is a cross-party political agreement that GNPC should be an active participant in the industry and Ghana should strive towards ownership. Technical and financial assistance from Norway's Oil for Development programme have contributed to shape a regulatory advantage for Ghanaian companies—along with a longstanding legacy of state-owned companies participating in industry in Ghana.

[41] The period of Tsikata's leadership at GNPC was a period of economic hardship in Ghana. Structural adjustment programmes left the Rawlings government short of cash; and without any commercially viable oil and gas deposits in GNPC's portfolio, Tsikata decided to diversify GNPC's resources into non-core oil and gas activities, investing in cocoa farms, salt production, gold production, and the telecommunication industry, among others. Killick, T. (1978), *Development Economics in Action: A study of Economic Policies in Ghana*. London: Heinemann; Opoku, D. K. (2010), *The Politics of Government–Business Relations in Ghana, 1982–2008.* New York: Palgrave Macmillan.

[42] Hickey, S., Abdulai, A.-G., Izama, A., and Mohan, G. (2015), 'The politics of governing oil effectively: A comparative study of two new oil-rich states in Africa', Effective States and Inclusive Development Working Paper No. 54.

However, when the NDC came to power again in 2008, the GNPC saw heavy investment in recruitment and capacity-building. Technical and political personnel were rehired into the corporation. NDC did not revert the changes regarding GNPC's regulatory mandate, but re-established the corporation's strong position in the industry. With Tsikata released from prison, the party started investigation of the EO Group and Kosmos, as discussed earlier.

While GNPC has been instrumental to the growth of Ghana's petroleum industry, the strategic reversals that occur when there is a change in government limit the long-term technical and financial stability of the corporation. The change of staff with a new government can be critical in a country and industry with a limited number of experienced technical and managerial personnel.

Ghana National Gas Company

Ghana National Gas Company (GNGC) was established as a limited liability company in June 2011 and made a subsidiary of GNPC in 2015. The main aim of GNGC was to construct and operate the Western Corridor Gas Infrastructure Development Project, including the Atuabo Gas Processing Plant, located in Nzemaland in Ghana's Western Region.[43] The processing plant was delayed for months due to the government's failure to pay the main contractor, the Chinese national petroleum company, Sinopec. First gas was achieved in November 2014.

GNGC supplies a range of companies with gas products. The largest customer is the Volta River Authority, a state-owned company that generates electricity for Ghana's national electricity grid. The Volta River Authority supplies electricity to state-owned Electricity Company Ghana. Participation in this supply chain has restricted GNGC's cash flow. The Volta River Authority is reported to owe GNGC US$500 million,[44] which they have stated that they will not be able to pay unless Electricity Company Ghana pays its outstanding debt. Electricity Company Ghana in turn blames Ghanaian consumers for lack of payment for electricity. The financial difficulties experienced at GNGC have delayed further development of the Atuabo Gas Processing Plant and restricted GNGC's capacity to take on new projects.[45]

With the latest change in government, the NPP is now reviewing and investigating the deals that were made between the NDC government and independent power producers. The former minister of power, Kwabena Donkor, has been subjected to police investigations. President Mahama created the post of minister of power to tackle the power shortage in Ghana. Shortly after coming into office, the NPP government merged the Ministry of Power with Energy and Petroleum [46] and started investigations. One power purchase was referred as the 'Ameri Energy deal'. Akufo-Addo's investigation committee concluded that the price of this deal, which included the purchase of 10 gas

[43] See Ministry of Petroleum (2015), 'Gas master plan', December: http://pdf.usaid.gov/pdf_docs/PA00M84F.pdf (accessed 1 October 2017). The gas processing plant is connected to the Jubilee field by 58 km of offshore pipelines and 111 km of onshore pipeline. The Jubilee partners provide the gas, and the plant has the capacity to process approximately 150 million cubic feet of gas a day. A pipeline connects the plant to thermal power stations in Takoradi.

[44] See My JoyOnline (2017), "'VRA debts to Ghana Gas could spiral out of control -- —PIAC warns"', 17 January: http://www.myjoyonline.com/business/2017/january-17th/piac-warns-against-ballooning-vra-indebtedness-to-ghana-gas.php (accessed 27 October 2017).

[45] Delays and financial difficulties for GNGC became a concern for Eni and the development plan for the Sankofa field. GNGC had to provide a financial guarantee for the gas from the field. The limited liability status of GNGC and its poor balance sheets were not sufficient. It was therefore announced in the 2015 budget plan that GNGC would be consolidated with GNPC as the latter's subsidiary. This, along with an extensive World Bank guarantee, provided sufficient assurance for Eni to move forward with the Sankofa field.

[46] See CitiFM Online (2017), 'Akufo-Addo merges energy and power ministries',
10 January: http://citifmonline.com/2017/01/10/akufo-addo-merges-energy-and-power-ministries/ (accessed 10 September 2017).

turbines, had been 'bloated' with approximately US$150 million when compared to an equivalent Turkish deal.[47]

The NPP government has appointed new management at the GNGC and replaced a few nonmanagerial positions.[48] Their first challenge will be to recover the debt from state-owned institutions and continue the development of the Atuabo Gas Processing Plant. The challenges have to be addressed at the same time as the new managers, some with limited experience in the sector, receive training regarding the gas projects. The continued overhaul of state-owned corporations every 8 years limits the long-term technical and financial prospects of Ghana's petroleum corporations.

Service Sector

To operate in Ghana's upstream service sector, a foreign company has to form a joint venture with an indigenous Ghanaian company, which must have a minimum of 10% equity participation.[49] The local-content regulation gives Ghanaian companies priority in the tender process and requires the employment of local workers if available. As such, the Ghanaian service sector has the potential to develop along with the upstream industry, with further possibilities of expanding into neighbouring countries making discoveries in the Gulf of Guinea.

Service companies in Ghana's oil city Takoradi report that low crude oil prices have created a challenging operating environment. Interestingly, since the decline of crude oil prices, several new Ghanaian companies have been established, increasing competition for local contracts. This growth in companies has been driven largely by former employees of the international service companies who, after being made redundant, established their own companies and joined the bidding for local contracts.[50]

The initial hype and high international oil prices at the inception of Ghana's offshore industry led to many new companies being established. Some of the companies were established only to operate as intermediaries between international and domestic companies or to establish joint ventures without offering more than the Ghanaian nationality of a few individuals. This trend declined due to low prices and high competition among the Ghanaian service companies.[51]

Political polarization is not limited to state-owned corporations. Many domestic entrepreneurs and business owners have a close relationship with one of the political parties. Party-loyal business owners often receive contracts from state-owned corporations or the government directly, and remain dormant when their party is not in power.[52] This trend further diminishes the long-term stability of the service sector. However, this does not apply to all service companies, as there are ways to remain party-neutral in the petroleum industry.

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[47] See CitiFM Online (2017), 'Ameri deal to be abrogated over $150m "bloated" commission—Committee', 27 March: http://citifmonline.com/2017/03/27/ameri-deal-to-be-abrogated-over-150m-bloated-commission/ (accessed 10 September 2017).

[48] See Ghana Web (2017), 'Owusu Bempah is new Ghana Gas communications director', 10 May: https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Owusu-Bempah-is-new-Ghana-Gas-Communications-director-536615 (accessed 15 October 2017).

[49] Petroleum Commission (2016), 'Guidelines for the formation of joint ventures companies in the upstream petroleum industry of Ghana', March: http://www.petrocom.gov.gh/assets/JV%20Guidelines.pdf (accessed 1 October 2017); Ministry of Energy (2013), 'Petroleum (local content and local participation) regulations, 2013 (LI 2204)', November: http://www.energymin.gov.gh/sites/default/files/13-Local-Content-and-Local-Participation-Regulations-L_I-2204.pdf (accessed 1 October 2017).

[50] Telephone interviews conducted with three oil service companies in Takoradi/Accra, 20 September 2017.

[51] Telephone interviews conducted with three oil service companies in Takoradi/Accra, 20 September 2017.

[52] Opoku, D. K. (2010), *The Politics of Government–Business Relations in Ghana, 1982–2008*, New York: Palgrave Macmillan.

5. The Voltaian Basin

During the opening ceremony of the Sankofa field in the Western Basin, newly elected President Akufo-Addo stated that he would soon launch an operation to 'find oil in the Voltaian Basin'.[53] The new NPP government pledged to develop onshore oil and gas in less than 2 years, continuing work that was initiated by the previous NDC government. The NDC promoted the Voltaian Basin as GNPC's flagship project and embarked on a 5-year initial exploration programme (2015–2019) called the Voltaian Basin Project. The project included 2D seismic data acquisition and processing, environmental impact assessment, community relations management, and drilling of two conventional wells. NDC's vision was for the basin to be managed to a large degree by GNPC. The NDC government gave out one exploration and production licence in 2014. However, it is expected that NPP will take a more aggressive approach, inviting larger international oil companies to the basin.

The Geology and History of the Voltaian Basin

Gravity surveys of the basin were conducted in the 1950s and 1960s.[54] A Soviet/Romanian team of geoscientists exploring the basin in the early 1960s came across traces of oil and gas.[55] Reports on those findings attracted Shell, which conducted an airborne magnetic survey in 1970–71. Shell acquired 208 km of 2D seismic data that led to the drilling of the first exploration well in the basin, Premuse-1, in July 1977. The well was abandoned 2 months later due to the poor reservoir quality.[56]

Drilling and geophysical data have demonstrated the basin's complex formational structure, which suggests a good probability of stratigraphic and structural traps. As such, the basin displays favourable preconditions for commercial oil and gas potential.[57] GNPC claims that there have been results from 48 wells in addition to a Voltaian super-group compromising Bambouka-Afram, Oti Penjari, and Obosum, located in different parts of the basin.[58]

The Voltaian Basin's sedimentary neo-Proterozoic rocks have similarities to hydrocarbon-producing areas in North Africa such as Morocco, Algeria, and Libya. Exploration in the basin is perceived to carry high risk, due to the probable geological history of the subsurface. Located in the southern part of the Basin, Volta Lake—one of the world's largest constructed lakes—further adds to the complexity of acquiring seismic data in the area.

In December 2014, the Swiss African Oil Company was awarded the newly defined Keta Delta block, which measures about 3000 km^2. PET Volta Investment and GNPC are participants in the block. The Swiss African Oil Company have stated their intention to carry out 2D seismic surveying and, if initial

[53] Modern Ghana (2017), 'Akufo-Addo eyes fourth FPSO as search for Volta Basin oil goes on', 6 July: https://www.modernghana.com/news/786722/akufo-addo-eyes-fourth-fpso-as-search-for-volta-basin-oil-go.html (accessed 1 October 2017).

[54] The Voltaian Basin is characterised as thick sedimentary neo-Proterozoic formations, with over 6 km of sediments present in the deepest part of the basin to the east. The upper Voltaian has massive and thinly bedded sandstones with some shales. The middle Voltaian has sandstones with limestone intercalations, shales with limestone intercalations, siltstones, silty sandstones, and conglomerates. The lower Voltaian is characterised as sandstones, shales and siltstones, and quartz sandstone. See Petroleum Commission (2017), 'Sedimentary Basins': http://www.petrocom.gov.gh/sedimentary-basins.html (accessed 15 October 2017).

[55] The Gold Coast Geological Survey conducted the first geological study of the Voltaian Basin in 1913.

[56] Apesegah, E. (2008), 'Hydrocarbon potential of the Voltaian Basin (Post-Premuase-1 Well)'. in Kalsbeek, F. (ed.), *The Voltaian Basin, Ghana Workshop and Excursion, March 10–17, 2008,* Geological Survey of Denmark and Greenland Ministry of Climate and Environment.

[57] Bozhko, N. J. (2008), 'The oil potential of the Voltaian Basin', in Kalsbeek, F. (ed.), *The Voltaian Basin, Ghana Workshop and Excursion, March 10–17, 2008,* Geological Survey of Denmark and Greenland Ministry of Climate and Environment.

[58] Ghana National Petroleum Corporation (2015), 'The Voltaian Basin: A new look at it prospectively', 22 April: http://www.cwcghana.com/wp-content/uploads/2012/01/1.-James-Yamoah.pdf (accessed 15 October 2017).

drilling proves successful, 3D seismic surveying. They refer to analyst estimates of 100 MMbo in the area. There has been no announcement of significant findings or development of the project to date.[59]

The Politics of the Voltaian Basin

The search for hydrocarbons in the Voltaian Basin has to be examined in Ghana's larger political context. Of course, both political parties would benefit from discoveries in the basin and the resulting income. For the NPP, spearheading oil and gas production in the Voltaian Basin will add to the party's reputation for and legacy of developing oil and gas resources in the country. However, exploration in the basin will be capital intensive, and the majority of GNPC's capital is currently tied up in oil and gas projects in the Western Basin. The latest chief executive officer of GNPC, Kofi Sarpong, has already indicated that the corporation lacks funds to pursue Akufo-Addo's election promise.[60]

The Voltaian Basin remains a financial conundrum for Ghana's government, which is restricted, under the terms of its credit agreement with the International Monetary Fund, from financing state-owned enterprises. Making promises of prosperity, on the other hand, costs nothing. The oil and gas prospects of the Voltaian Basin have been repeatedly mentioned in the run-up to national elections. The Voltaian Basin's industrial potential represents potential profits not only for the Ghanaian state but also for thousands of communities that have been promised sufficient compensation for land and employment for the youth. So far, communities targeted by GNPC's 'community engagement management' exercises have welcomed the possibility of oil and gas development, largely due to the promises made during these exercises.[61]

The government's development agenda for communities within the Voltaian Basin plays on popular regional development politics. While some regions in Ghana remain party strongholds, 'swing regions' have become more and more common in national elections.[62] The Voltaian Basin covers four of Ghana's administrative regions and a large portion of the voting population. At an election rally in the Volta Region in 2016, then candidate (now President) Akufo-Addo promised the NPP would develop the Voltaian Basin for oil and gas production and provide economic development and jobs, similarly to what had been done in the Western Region.[63]

Current crude oil prices, combined with the geological (and to some extent political) uncertainties of onshore production in Ghana, might suggest a pessimistic outlook for the Voltaian Basin. However, there is political will in Ghana to develop the basin's resources to provide economic growth and foreign exchange for the government. It remains uncertain whether the new NPP government will be able to attract companies willing to take the on the risk and deploy the needed technology, capital, and expertise.

Socioeconomic Risks

Ghana has a long history of resettling communities to make way for natural resource exploitation projects. The Volta River Project included the building of the hydroelectric dam at Akosombo, which required the resettlement of 78,000 people in the early 1960s.[64] More recently, resettlement of

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[59] See Swiss African Petroleum (2017), 'Ghana': https://www.swiss-african-petroleum.com/swaoco.html (accessed 13 October 2017).

[60] See *Business and Financial Times* (2017), 'Economy to miss out on potential oil revenue from oil Voltaian basin (Ghana)' 12 July: https://asokoinsight.com/news/economy-to-miss-out-on-potential-oil-revenue-from-oil-voltaian-basin-ghana (accessed 15 October 2017).

[61] 'GNPC creates awareness On Volta Basin', http://theheraldghana.com/gnpc-crates-awareness-on-volta-basin/ (Accessed 1 December 2017).

[62] Jockers, H., Kohnert D., and Nugent, P. (2010), 'The successful Ghana election of 2008: A convenient myth?', *Journal of Modern African Studies,* 48(1): 95–115, p. 95.

[63] 'Election 2016: I will not disappoint Voltarians—Nana Addo', http://www.pulse.com.gh/news/politics/election-2016-i-will-not-disappoint-voltarians-nana-addo-id5792537.html (accessed 15 October 2017).

[64] Miescher, S.F. (2014) '"No one should be worse off": The Akosombo Dam, modernisation and the experience of resettlement in Ghana', *In Bloom, P.J. Miescher, S.F. and Manuh, T. (eds) Modernisation as Spectacle in Africa*. Indiana: Indiana University Press.

communities to clear land for gold and bauxite mining has led to loss of agricultural land and agitation among affected communities. [65] While resettlement in Ghana has come through policy, and communities have been offered a range of compensation including land, there is a general dissatisfaction with the process. This can be turned into political leverage during national elections, and presents a threat to the companies involved.

In addition to generating Ghana's hydropower, the Volta Lake and connecting rivers have major economic importance for the communities surrounding them. The inland water system hosts a large portion of Ghana's fish resources, including most large-scale commercial fish farms. Tilapia, an important part of traditional Ghanaian cuisine, is the predominant fish species in the lake. Inland trading centres can be found around the Volta Lake, and they rely on the water for fishing as well as transport to urban markets in southern Ghana. [66] The lake is used for transportation of people and livestock as well as commodities such as cement and petroleum products.

The need for resettlement, and resistance from established socioeconomic systems and local political structures, are some of the foreseeable challenges to onshore production. These challenges are not present with offshore oil and gas. Since there is no prior onshore oil and gas exploitation to compare with, it is difficult to predict the outcome. However, previous experiences with relocation schemes as well as the economic significance of the lake and rivers for local communities indicate the challenges and risks that can be associated with an onshore project.

These factors do not rule out the possibility of onshore oil and gas development in Ghana, but they do suggest that it will be different from already established petroleum projects. The steady growth observed in the Western Basin, the growing capacity of the Ghanaian petroleum industry, and the NPP's ability to facilitate foreign investment justify optimism about an expansion of the industry.

6. Conclusion

Ghana's petroleum industry has seen steady growth despite declining international oil prices in recent years. Having joined the league of oil- and gas-producing nations with the discovery of the Jubilee field in 2007, today Ghana can boast of three offshore oil and gas projects in the Western Basin, providing an output of 126 000 bopd. Moreover, the Sankofa field is projected to contribute significantly to domestic gas production. Increased gas production will aid the electricity sector and have wider positive effects in the economy. The new industry has attracted a range of international companies and fuelled a new domestic industry that is becoming crucial for the country's economic growth. As border-dispute-related issues in the Tano Basin are resolved and technical challenges in the Jubilee field will be resolved with time, the production level is expected to grow further even without additional projects coming onstream.

With no major civil conflict in the country since independence and three peaceful turnovers of power since the inception of the Fourth Republic in 1992, the country is renowned for the stability of both its democracy and its business environment in an African context. With the usual caveats about political predictions, the current NPP government could be in power for two terms. This would provide stability for international and Ghanaian petroleum companies and could lead to further expansion of the industry, perhaps even the development of onshore oil and gas production in the Voltaian Basin. However, polarization between the two main political parties will likely continue to impact institutional stability and limit the long-term potential for state-owned enterprises in the petroleum industry.

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[65] Cieem, S., Ayensu-Ntim, A., Twumasi-Ankrah, B., and Barimah, P. (2009), 'Effects of loss of agricultural land due to large-scale gold mining on agriculture in Ghana: The case of the Western Region', *British Journal of Research 2(6)*.

[66] See ATFALCO (Ministerial Conference on Fisheries Cooperation among African States Bordering the Atlantic Ocean) (2012), 'Fishery and aquaculture industry in Ghana: Series report n°1 of the review of the fishery and aquaculture industry in the 22 ATLAFCO member states', October: http://www.comhafat.org/fr/files/publications/112102014102624AM.pdf (accessed 20 October 2017).