Early Oil from Turkana
Marginal Benefits / Unacknowledged Costs
The long-term prospects for Turkana oil continue to improve. Tullow and Africa Oil report that the volume of oil available in the South Lokichar Basin is even higher than previously assumed. The barrier to the exploitation of Turkana oil continues to be oil export infrastructure. The only viable approach to the full development of the oil fields is a pipeline to the coast.

Available evidence suggests that there is enough oil in the South Lokichar Basin to support an independent pipeline. The Government has recently put out a tender for an engineering plan (known as a Front End Engineering and Design or FEED) and an environmental and social impact assessment for the pipeline. An independent pipeline however will almost certainly result in additional delays. Tullow now reports that the earliest possible date for first exports through a pipeline is 2021. If depressed oil prices continue, further delays can be expected.

Faced with a growing time gap before pipeline-based exports, the Kenyan government is pressing for an interim transportation solution to kick-start exports. Starting in late 2015, reports surfaced of a plan to export Turkana crude oil by truck to Eldoret and then by train to the retrofitted refinery in Mombasa. There have been media reports on the early oil proposal, but there is little information in the public domain about plan for early oil production or its economic implications.

The Kenya Civil Society Platform on Oil and Gas is committed to expanding transparency and increasing public awareness on the prospects for oil development in Kenya. In particular, the Platform seeks to contribute to a public assessment of both the costs and benefits for the citizens of Kenya generally and the oil host communities specifically.

The KCPOG disseminated a report on the economics of Turkana oil and the implications for potential government revenue. Drawing on the full range of public domain data combined with export industry knowledge that report sought to illustrate the timelines and scale of potential oil production, and to assess the economic benefits to both the companies, government, counties and communities. The report explicitly laid out the underlying assumptions related to production and cost estimates, the fiscal terms applicable to Turkana oil blocks and the impact of differing oil price scenarios. In this paper we employed a similar methodology in order to assess the economics of the early oil proposal and the implications for companies and the various levels of government and communities.

The Rationale for Early Oil

Public statements have pointed to a number of different reasons for proceeding with a truck/train export scheme rather than focusing exclusively on pipeline exports. Specifically, Tullow has claimed that the early oil scheme would:

- be a valuable precursor to full field development;
- establish commercial, infrastructure and logistical arrangements;
- provide important oil reservoir information;
- establish an international market place for Kenya’s crude oil;
- test management of community concerns and issues, and,
- stimulate critical infrastructure development in Turkana County.

While there may be an element of truth to each of these claims, more reasons do not necessarily make a more convincing case.
Tullow’s full field development (FFD) proposal is for a phased development coinciding with the completion of the pipeline. Production would start at around 75,000 barrels of oil per day and ramp up over time to around 150,000 barrels of oil per day. This approach is entirely consistent with good oil sector practice and does not require small-scale early production\(^5\). Tullow early oil proposals in Uganda, for example, have been abandoned without any negative consequences for the long-term project (See Textbox 1).\(^6\)

The other reasons that Tullow provides for proceeding with early oil are also of debatable significance. Initial levels of early oil production will actually provide very little new reservoir data, as the oil will come from appraisal wells where solid data already exists. And while there are certainly concerns about the marketability of waxy Turkana crude, identifying an appropriate refinery could be done quickly once pipeline exports begin. The other reasons offered by Tullow make the fairly obvious point that beginning small operations provide a transition to larger operations. This is undoubtedly true, but says little about the value that this represents to the companies or Turkana. Of import is a cost benefit analysis of the scheme.

**Early Oil Production Scheme**

The “early oil production scheme” (EOPS) is not an alternative to a pipeline. Tullow’s primary objective remains the construction of a heated pipeline to the coast to allow for “full field development” (FFD). With a pipeline in place, early production volumes of around 75,000 barrels of oil per day (bopd) could be expected, with a potential doubling over time to around 150,000 bopd.

Early oil then is seen as an interim measure that would enable the country to achieve first oil exports, maintain project momentum, and generate some useful technical information. The transport options however are a last resort. Trucks are used in some places to move oil, but as one oil executive says, “You don’t truck if you can rail and you don’t rail if you can pipeline.”\(^7\)

The project will combine small export volumes and high transport costs. This means that neither the company nor the government will generate significant economic benefits.

**Oil Production**

The base plan is for the production and export of 2,000 barrels of oil per day (bopd) for possibly two years. At this level there are no significant challenges for upstream production. Tullow has five suitable exploration and appraisal well at a number of field locations in Blocks 10BB and 13T that could easily generate this volume of oil\(^8\).

Consideration has also been given to potential expansion of production up to 4,000 bopd once the transportation system has been proven. This increased level of production would also possible, though it would require greater investment including drilling five additional wells, expanding processing and storage facilities, and installing water injection capacity to provide pressure support for the reservoirs. Newspaper reports suggest plans for increased production up to 10,000 bopd in advance of pipeline exports, but this would be dependent on significant recovery of oil prices and a proven transportation system.\(^9\)

**Oil Transport**

Transportation would be based on a combination of truck and train. As is the case with the pipeline, the waxy nature of crude oil from the Lokichar basin means that the oil must remain heated during storage and transportation adding complexity and cost.
According to the plan, oil is to be loaded into heated tankers known as “isotainers.” Each isotainer holds about 70 barrels of oil and weighs around 10 tonnes. The heated isotainers are able to keep oil at a temperature of 75-80 C. The isotainers are held within a metal frame and can be moved like a standard 20-foot shipping container. The isotainers would be loaded onto a truck and then transferred to a train wagon with the oil remaining in the same container from the time it is loaded in Lokichar to the time that it is unloaded at the refinery in Mombasa.

The first step of the journey will be by truck, 320km down the down the A1 from Lokichar to a transfer depot at Eldoret. Tullow estimates that the round trip will require just over 3 days with around 30 loaded trucks making the journey each day. Major road upgrades will be required including rehabilitation of the road between Eldoret-Kitale and onwards to Lokichar and the replacement of the Kainuk Bridge. Although there are medium term plans for a full upgrade to the A1 road system, initial plans suggest a short-term fix with the tarred surface from Lokichar to Kitale expected to last only around three years. The road upgrades are estimated to cost around $50 million over a period of 12-18 months. Unlike other parts of the infrastructure upgrades required for the EOPS, these road improvements are badly needed even in the absence of oil exports and form a legacy promise undelivered by subsequent governments to the Turkana people.

Figure 1: Tullow Early Oil Pilot Scheme (EOPS)
The trucks will transport the isotainers to a container depot in Eldoret. Here they will be transferred by crane onto train wagons, with two isotainers per wagon, and transported to the refinery in Mombasa. Shipping time is expected to be about three days in each direction.

The final stage of the process is the transfer of the oil from the isotainers into heated storage tanks at the Mombasa refinery. The refinery has been closed since 2013. Reports suggest that the government has approved the payment of $5 million to buy out its partner ESSAR of India. This would enable government to use the refinery for the storage and export of Turkana crude. The facility, to be managed by the Kenyan Pipeline Company, will require additional investment. While the existing storage tanks have heating coils, they may need refurbishment. The existing Kipevu oil import terminal will need to be converted to handle crude for export.

Crude oil will be held in the heated tanks until a sufficient volume has accumulated – likely around 120 thousand barrels. A heated tanker will then transfer it to a refinery in East Asia (i.e. India or Malaysia). According to officials a market for the crude is yet to be ascertained.

The total round trip for an isotainer is estimated at nine days. Production volumes of 2,000 bopd would require around 175 isotainers.

Some media reports have suggested that production might begin sometime in 2016. Tullow has indicated that the earliest possible start date would be the middle of 2017. Infrastructure upgrades and the necessary environmental and social impact assessments could easily result in further delays.

Textbox 1: Tullow’s Aborted Early Oil Plan in Uganda

This is not the first time that Tullow has proposed early oil production in East Africa. In 2008-09 Tullow was preparing an Early Production Scheme (EPS) in Uganda. An initial plan to produce 2,000 barrels per day was quickly expanded. According to the Government’s 2008 Petroleum Policy, “Plans are underway to produce 4,000 barrels of oil per day (BOPD) from the reserves identified to-date. This production will feed an Early Production Scheme (EPS) scheduled to start producing kerosene, diesel and heavy fuel oil during 2009.”

As more oil was found, plans were expanded again with Tullow reporting in 2009 that: “It is expected that a Plan of Development will be submitted to the Government of Uganda by mid-2010 for approval and subsequent project sanction. Production from this field is expected to commence by the end of 2011. The oil will initially be transported by truck and later by pipeline to a central gathering and distribution hub for onward transportation to domestic and regional markets. Initial production capacity is expected to be around 10,000 bopd.”

By 2010 Tullow and the Government had abandoned the plans for early oil. In 2013, the Government prepared plans for development of a full-scale refinery. The contract was awarded to RT Global Resources of Russia in 2015 but the firm has now withdrawn from the deal and new negotiations have begun with SK Engineering and Construction of South Korea. It is unlikely that oil production destined for a refinery will come on-stream before the early 2020s when a pipeline to the coast should allow for international exports of crude.
Project Viability

Economic analysis of the viability of the project and the potential economic benefits for the company and the government depend on assumptions related to production, costs, transportation tariff, oil price and fiscal terms. The assumptions used in this analysis are set out below.

**Production Volumes:** Production and export assumptions are taken from Tullow’s proposal of January 2015. Exports of 2,000 bopd are projected to begin by the middle of 2017 and run for a period of two years. We also consider an expanded early oil scenario, as set out in the Tullow proposal, with production ramping up to 4,000 bopd by the middle of 2019.

**Project Costs:** The early oil production scheme is not viable unless the project is heading towards full field development, including the development of a heated pipeline. In this analysis, we include only capital costs that are required solely for the EOPS and not the substantial capital costs that would be necessary for full field development. Similarly, we do not include infrastructure costs including the upgrades to the A1 and the bridge that are needed irrespective of the early oil proposal. Finally, we assume that, wherever possible, equipment will be leased rather than purchased, as it will have no purpose once pipeline exports begin.

Transport by road and rail will be more expensive than transport by pipeline. The additional costs have a decisive impact on the economics of the early oil scheme. Government officials indicate that transport costs may be as little as $2 per barrel higher than a pipeline. While there are no reliable estimates for the tariff on a Kenya-only pipeline, speculation ranges from $12-15 per barrel. Our estimates suggest that the costs for the truck/train scheme are likely to be much higher including leasing of isotainers ($2.20), road transport ($10.50), rail transport ($6.50), and port fees ($2.25). Details of cost estimates are provided in Annex 1.
**Oil Price:** The oil price collapse has jeopardized many green-field oil projects with companies consolidating their efforts around existing production. The price recovery into the $40s has increased the viability of new projects. We examine the economics of the EOPS at two different prices for Brent crude: the current price in September 2016 ($46/bbl) and the average futures price over the estimated period of production ($56/bbl).\(^ {13}\) We also include an expected discount to Brent crude of $8/bbl due to lower quality crude.\(^ {14}\) The discount is likely to be particularly high given the low volumes of production compared to full field development (FFD).

**Fiscal Terms:** The fiscal terms for Turkana crude are set out in production sharing contracts (PSCs) signed for Blocks 10BB and 13T in 2007/08. While we understand that new agreements will be negotiated for the EOPS, there are no details in the public domain. We base our analysis, therefore, on our best understanding of the terms that will apply to full field development.\(^ {15}\) Kenya has adopted a classic production sharing system. Production is first allocated to the company recovery of costs. A limit on the volume of production allocated to “cost oil” is set at 60%. The result is that at least 40% of production becomes “profit oil” even if the project is losing money, and is divided between the company and the government based on the volume of production. As the EOPS will never exceed the first production threshold, we assume that 50% of profit oil will be allocated to the government.

Adopting the existing fiscal terms almost certainly over-estimates the revenues that will flow to the government. The cost recovery limit combined with an even split of profit oil would mean that the bulk of the very modest economic benefits flowing from the EOPS would go to the government. As it is the government that is pressing for the EOPS, we assume that Tullow will be able to negotiate more favorable terms. The government revenue projections provided below, therefore, are almost certainly over-estimates.

The government has the right to hold an equity stake in the project (20% for Block 10BB and 22.5% for Block 13T). We assume that while the government will participate at these levels for the full field development, they will not be equity partners for the EOPS.
Economic Analysis

The economics of the base case with production of 2,000 bopd over two years are not positive. The total volume of oil produced and exported would be around 900,000 barrels. Combined capital, operating and transportation costs would be around $63 million. With oil prices at $46/bbl, total project revenue is only $34 million. Assuming higher oil prices of $56/bbl, revenues increase to $43 million but are still well below project costs. Although the project would be losing money, under the existing fiscal terms the government would still receive their share of the 40% of profit oil after 60% of production was allocated to cost recovery. If these fiscal terms remain in place—unlikely given that they are lopsided in favour of the government in such a small project – total government revenue would be around $9 million.

Project Risks

It would appear that matters external to economics are a significant driver behind the push for early oil. In an election year, the official launch of production of oil could be heralded as a key milestone for government. It could also be viewed regionally as Kenya taking the lead in the development of its resources.

Unmet Expectations: The passage of the petroleum bill, with a percentage share of petroleum revenues to be allocated to county and community, may lead to unmet expectations. Managing expectations of communities who have been led to believe that they will earn a share of proceeds is difficult when trucks depart but few proceeds return. It could be argued that a significant political dividend can be gained (especially for the Turkana people) by the construction of the road and related infrastructure even without the launch of a loss making early oil project. Nationally, citizens have equated the finding of oil with reduced prices at the pump, and announcement of production and transportation to the Mombasa refinery will increase these perceptions.

The Election: The general election is slated for August 2017, and the early oil scheme is proposed to begin two months earlier in June. Specific risks arise from the scheme beginning at the peak of the political campaigns. The National Cohesion and Integration Commission identified 19 counties at risk of violence in 2017. Of the 19 counties, 6 of the counties lie on the proposed route of the proposed early oil route. Turkana, Pokot and Eldoret are on list of counties further increasing the risk. The report identifies counties likely to have close governor and senator elections as priority areas for monitoring over this period. The two key counties of Turkana and Pokot are likely to have closely fought contests not only at governor level but also MP level. In 2007/8, post-election violence a key tool of protest was the blocking of roads and uprooting of the rail in certain areas. This portends a serious risk for the early oil scheme.
The economics of the project look somewhat better if we assume that the truck/train transportation system proves to be viable, and that that export volumes increase to 4,000 bopd and continue until 2021. The combined capital, operating and transport costs remain high at around $145 million. However, production volumes also increase significantly to more than 3.2 million barrels. At $46/bbl, project costs exceed gross project revenues by around $20 million – the project does not break-even. Assuming that fiscal terms remain the same, government revenue through its minimum share of profit oil would be around $27 million in total over the four years of production. If oil prices were to rise to an average of $56/bbl, total project revenue would increase to $156 million. Under this higher price scenario, net revenue would be around $10 million. Overall government revenues through its minimum share of profit oil would be around $34 million.

**Logistical Failure:** A key advantage of early oil production is establishing Kenya’s status as an oil-producing country. However, this is largely dependent on the delivering of a smooth operation in a situation of a complex and untested logistical operation. If there are malfunctions, accidents and/or protests, it could in effect demonstrate the opposite.

**Health and Safety:** The increased movement of trucks and trains can also be expected to have a significant health and safety impact. Kenya’s Rift Valley Railways (RVR) shall be used in the Early Oil Pilot Scheme to transport the crude oil from Eldoret to Mombasa, with Tullow estimating a three-day trip. The RVR has been plagued by incidents that put into question its operational efficiency. (SEE Annex 2)

The proposed tariff of $ 6.50 plus additional handling fees also makes this a very expensive option for transportation.

Kenya also has a history of accidents when trucking/train petroleum products, as shown in the table below. The parking of petroleum trucks at night, which is unregulated, is also considered a high-risk practice.

**Experience from Mozambique**

Mozambique, a producer of coal, transports the coal on train. Challenges to the infrastructure are costly to companies and causes a significant number of inefficiencies. The trains experience a number of accidents both via collisions and by derailment. These have a led to a number of deaths. In February 2015, 17 people were killed when a freight train derailed in Mozambique’s capital. Another train accident, this time a collision with a truck, transporting coal Mozambique killed 26 people in July 2012 in South Africa and injured several others.
Kenya’s history with trains and trucks indicates that managing to efficiently transport oil from Turkana to Mombasa will be a challenge. It may serve to further highlight the infrastructure problems the country faces. This could have consequences for the company and for government, including protests from affected communities along the truck and train routes.

### Conclusions

At first glance, the EOPS might seem like an obvious stepping-stone to full field development. It is clear that the principal rationale for early oil cannot be revenue. The very modest amounts of production could not generate significant revenues for either the company or the government. Nevertheless, it would be reasonable to assume that both company and government had undertaken feasibility studies showing that the project is at least economically viable.

Our economic analysis suggests that in the absence of very optimistic assumptions, project costs exceed gross project revenue. Furthermore, in our analysis we ignore substantial costs including all capital investments that are also necessary for full field development as well as the costs of the road improvements and bridge replacement. Even then, under most of the scenarios analyzed, more money is spent producing and transporting the oil than its sale value.

In the absence of a significant increase in either oil price or export volumes, the EOPS is a money-losing venture. The project generates some net income if we assume an increase in oil price to an average of $56/bbl and an increase in export volumes to 4,000 bopd. Both assumptions however are risky. There has been no consistent pattern to oil prices in recent months, and some analysts are certainly predicting that low prices could continue well into the future. Similarly, there are no guarantees that increases in export volumes will be feasible. The first phase of the pilot project (2,000 bopd) may well demonstrate that the logistical challenges of moving waxy crude by truck and train are simply too complicated to allow for expansion.
Even if prices rise and production expansion proves viable, project revenues remain marginal with overall government revenues under current fiscal terms – almost certainly more generous that will ultimately be agreed – of no more than $35 million over the four years (2017-2020) before a pipeline could potentially be in place.

Before proceeding, all extractive sector projects should undergo a rigorous cost/benefit analysis. As the Environmental and Social Impact Assessment (EISA) will show, the project will generate some costs related to health and safety as well as to the environment. The EOPS is not a necessary step to full field development – in fact it may even be a distraction. Under reasonable assumptions, it appears that the project will lose money for both the company and the government. The value of the project therefore hinges on non-economic benefits.

For the company, these benefits appear to be very modest: gaining some additional reservoir data from wells where good data already exists; gaining a greater understanding of the refining challenges associated with Turkana crude; and maintaining project momentum in the face of the Uganda/Tanzania pipeline setback. Even taken together, it is hard to see how these factors make the project worthwhile.

For the Government, the non-economic benefits are on the one hand more abstract, and on the other hand more significant. However promising the resources in the South Lokichar Basin, it has no value until it can be exported. With 2021 as the best case scenario for oil exports through a heated pipeline (and further delays almost inevitable) the Government has a strong incentive for demonstrating progress by enabling oil exports, however marginal the volumes.

Whether the costs associated with the EOPS are worth the benefits – economic and non-economic – should be the subject of public debate. The conclusions of this analysis suggest that, at the very least, the answer is not obviously “yes.” It is hoped that the analysis in the pages above will help to inform that public debate.
NOTES

1 See, Africa Oil Announces Significant Increase 2C Oil Resources, 10 May 2016.
2 See Call for Expressions of Interest “Lokichar-Lamu Crude Oil Pipeline FEED,” 11 May 2016; and Tender Notice for ESIA, 5 May 2016.
4 See EOPS Drivers, Early Oil Production Scheme Master Deck, Tullow (n.d.)
5 Interview with industry practitioner September 2016
8 Kenya Early Oil – Final Report Summary, Tullow, January 2015
9 See Trucks, trains to ferry 10,000 barrels of Turkana crude per day, Business Daily, 23 August 2016.
11 Media reports have highlighted that Tullow currently holds 70,000 barrels from exploration drilling. This constitutes only about one month of production. It could probably be blended in with new oil once the transportation system is up and running. There are reports that the oil may still be in a liquid form. Even if true, it seems unlikely that this would have any fundamental impact on the project as waxy content in the oil clearly requires the entire transportation system to be heated.
12 Interview with official from Ministry of Energy and Petroleum.
13 Brent forecast of $56/bbl based on average futures quotations 2017-2020, CME Group.
14 Early exports will establish greater clarity on the size of the discount to Brent crude. Note that Africa Oil suggests in their recent resource estimate that the discount could be as low as $3/bbl. See, Africa Oil Announces Significant Increase 2C Oil Resources, 10 May 2016.
15 See, Potential Government Revenues from Turkana Oil, KCSPOG, April 2016, p. 5-7.

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