East Africa – Disputes, Pipelines and Wax

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Overview

- Uganda – refinery and pipeline plans progressing. Significant volumes EUR ~2.5Bn Bbl.
- South Sudan – significant oil volumes (3.5 Bn Bbls) but problematic relations, looking for Southern export route.
- Ethiopia - reports of 2 to 3 Bn bbls EUR but no production today. Also gas.
- Tanzania - gas discoveries - 25 PSA signed - BG, Ophir, Statoil and XOM. ~>50 TCF GIIP.
- Mozambique - Rovuma Basin - Anardarko and ENI. Overall ~ 150-200 TCF GIIP
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- Uganda – Upstream
  - Landlocked.
  - About to license >dozen new blocks – end 2014 licensing round.
  - 8 yrs since last round – moratorium to allow time to develop fiscal regime.
  - Quoted “reserves” of 3.5 Bn Bbl (but only ~50% “recoverable”!!!). More likely EUR of 2- 2.5 Bn Bbl.
  - 76 out of 88 recent wells encountered oil.
  - Three main players – CNOOC, Tullow and Total.
  - Production levels could be 200 kbdp over 3 decades.
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- **Uganda - Downstream**
  - 4 companies shortlisted to build new refinery (60kbpd) – likely start-up in 2018.
  - Mombasa to Eldoret products pipeline in Kenya currently provides product to Uganda (35 yrs/old). Possible pipeline expansion to Uganda and Rwanda. New Twin line also considered ($500mm).
  - Problems with this line caused recent price hikes in Uganda.
  - Consumption is about 20 kbpd products.
  - Proposed pipeline from Hoima to Lamu – 1400km; ~$4Bn – largest heated pipeline in the world.
Uganda Oil Refinery

- 260 km northwest of Kampala.
- National policy dictated refinery solution as part of national development. Build-Operate contract.
- $2.5 Bn price tag.
- Near Hoima, close to DRC and Lake Albert oil fields.
- Nominal 60 kbd (2x30 kbd trains, second train 2020).
- Includes pipeline to Kampala, storage facilities, road, hospitals etc.
- April 2013 – agreement between Govt and CNOOC/Tullow/Total to build refinery and pipeline.
- June 2014 – proposals submitted – 4 bidders.
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- Kenya – Upstream
  - 4 sedimentary basins including offshore.
  - Tullow/AOC to present FDP for South Lokichar in 2015.
  - Volumes of 600 MMbbl and are commercial (Reuters).
  - Crude is waxy, with pour point >40 Deg C, like in Uganda.
  - Moved to license open tendering recently and introduced PSC models for discoveries.
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▪ Kenya - Downstream
  – Only regional refinery at Mombasa; 80 kbd but operates significantly less capacity (~35 kbd). Refinery designed for heavier, sour Abu Dhabian crudes.
  – Consumption is about ~80 kbd petroleum products. Imports make up rest.
  – Proposed pipeline Uganda to Lokichar ties in to South Sudan pipeline to Lokichar, then Lokichar to Lamu port. Maybe added to LAPSSET.
  – Lamu Port Southern Sudan Ethiopia Transport (LAPSSET) project includes pipelines, new refinery near Lamu, railway, airports, new roads.
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**South Sudan**

- Landlocked.
- Reserves of 3.5 Bn bbls (BP Stats) mostly in Muglad and Melut basins. Waxy crudes. Significant gas but mostly flared.
- Much civil strife – only recently has peace broken out again.
- Current production – about 160 kbpdp – pipeline through Sudan – history of animosity and pipeline closures.
- Possibly future production of ~400 kbpdp.
- All petroleum products historically imported.
- Small new refinery – 3 kbpdp Unity, expansion to 5 kbpdp of diesel with Russian investment.
- Second new refinery (Upper Nile) being built -10 kbpdp.
- Proposed southbound pipeline.
Options for Sweet Waxy Crude

- Waxy crude with pour point - >40 Deg C.
- Solidification will block pipeline.
- Heated pipeline solution
  - Heating stations to heat crude
  - Electric trace – expensive and requires electrical generation
  - Pipe in pipe – expensive – still need to generated heated fluid (water) to pump through annulus.
- If flow stops or slows (heat dissipates before reheating) then potential blockage.
- There is always a risk of blockages – need to consider pigging and pigging stations.
Options for Sweet Waxy Crude

- Chemical suppressants to reduce pour point – expensive and science not well understood. Also reported concerns with corrosion rates etc.

- Or remove wax from oil and pump oil in “normal” pipeline (normally carried out in refinery)
  - Solvent extraction oil mixed with solvent (e.g. MEK), chilled, separated, solvent recycled.
  - Propane solvent dewaxing.
  - Membranes? Unproven.
  - Catalytic dewaxing – selective hydrocracking or isomerisation of long-chain paraffin molecules.
Waxy Crude – If you asked me....

- Possible to combine crude dewaxing facility at proposed Hoima oil refinery. Quadruple capacity vs standalone dewaxing for refinery.

- Crack or isomerise wax to refined products in refinery – generally produce good blendstock for gasoline/distillates.

- Dewaxed oil could be transported to coast through normal pipeline saving millions in CAPEX and OPEX.

- Still requires oil well to refinery solution – diluent/ pour point suppressant.

- Issue here: all players are E&P focussed – no integrated company to lead upstream-midstream-downstream optimisation.
Summary

- East Africa contains significant recoverable oil volumes and there is also gas.
- Usual problem persist with bilateral relations as well as Govt to Oilco relations.
- There is progress on regional infrastructure with a likely oil pipeline system possibly 3-5 years away.
- Uganda, Kenya, South Sudan and possibly Rwanda and Ethiopia are potential stakeholders.
- Crudes throughout the region are excellent quality with a potential market in Asia but contain significant wax content.
- Wax is a problem due to high pour point and must be considered optimally.
- Solutions to date promoted by upstream or downstream, no-one is thinking integrated yet.
- Given the nascent position, the potential throughout East Africa for oil is strong but the midstream and downstream will be important.
Thank You.

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