IMANI-FEEM Workshop

Natural Gas Price Formation in Ghana: Implications for Industrial Development and Inclusive Growth

Dr Theo Acheampong | Senior Research Fellow, IMANI Africa
Prof Manfred Hafner | Senior Research Fellow, FEEM

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Outline

Natural Gas Resources and Gas Policy in Ghana

Conceptual Framework
- Natural Gas Market Pricing
- Political Economy of Natural Gas Pricing in Ghana

Analysis and Discussion
- Landed Costs of Various Fuels
- Levies and Regulatory Charges
- Non-Payment Risks

Conclusions and Policy Recommendations
Economic context: Ghana’s growth momentum likely to be sustained

Real GDP growth recovered to 8.5% in 2017, 6.2% in 2018 after three years of sluggish growth (power on-off – a.k.a. ‘dumsor’)

- Growth underpinned by improving fundamentals – inflation, fiscal balances, stable currency.
- Increasing demand for natural resources - oil sector growth.
- Rapid urbanisation, increasing service sector activity and domestic demand.
- Energy needed to catalyse this growth: 10% y/y demand growth for power.

Ghana Versus Region’s Average

Source: IMF SSA Economic Outlook, Oct 2018
Ghana’s energy mix comes from five sources: **hydro, oil, natural gas, solar and biomass**.

Power sector is dominated by **thermal (59.9%), hydro (39.9%)** and less significantly, **renewable generation (0.2%)**.

Unreliable output from hydro dams means Ghana’s economy needs other sources of fuel for power generation.
The discovery of oil and gas in commercial quantities has changed Ghana's fuel supply dynamics. Aggregate reserves and resources in the highly prospective Tano Basin stands at 2.4 Tcf. Jubilee (90-120 MMscfd), TEN (40-70 MMscfd), Sanfoka (155-180 MMscfd), and Aker (50-100 MMscfd).

Despite this changing dynamic, issues of gas use, particularly the economic pricing of natural gas have not been fully explored. **Gas pricing often commercially and politically sensitive** but thorough understanding natural gas pricing is crucial in working out the linkages between energy security and inclusive development.
Upstream petroleum operations

• Exploration activity stalled since 2014 in response to low oil price, capital rationing and maritime border dispute with Cote d’Ivoire.

• Renewed focus on revamping stalled oil and gas exploration activity while commercialising existing producing assets – launch of first competitive licensing round in Oct 2018.

• Provision of fiscal and non-fiscal incentives to attract upstream investments, particularly targeting larger IOCs following the de-risking of Ghana’s western petroleum basin, and post-ITLOS revamp of activities.
Ghana’s gas industry model

**SUPPLY**
- Production Facilities, FPSO
- Imports
  - WAGP
  - LNG

**Domestic**
- Jubilee
- TEN
- OCTP
- HESS

**Processing System**
- Gathering pipelines
- Compressors
- Metering

**NGLs Export System**
- Pipelines; Tanks; Metering

**Transmission System**
- Pipeline
- Compressors
- LNG - FSRU

**GPP**

**RMS**
- Distribution Pipelines

**Demand/Market; Reception Facilities**
- Power Gen
- PetroChem
- Other Industries
- Vehicles

Source: Ghana National Gas Company, 2018
Gas infrastructure plan

Source: Ghana National Gas Company, 2018
Gas Pricing Mechanisms - Conceptual framework
Different price formation mechanisms exist across various markets:

- **Oil Price Escalation (OPE)**: indexation to competing fuels with escalation clause (typically crude oil and/or fuel oil, in some cases also electricity prices)

- **Gas-On-Gas Competition (GOG)**: interplay of supply and demand of gas-on-gas-competition (HH, NBP, TIF); gas is sold daily, monthly, annually or other periods; future markets NYMEX or ICE;

- **Bilateral Monopoly (BIM)**: bilateral discussions and agreements between a large seller and a large buyer with the price being fixed for a certain period (e.g. year). Typically the arrangement is at a government or state-owned company level. Typically a single dominant buyer or seller.

- **Netback from Final Product or Final Energy (NET):**
  - the price is a function of the price received by the buyer for the final product the buyer produces. E.g. gas as feedstock in chemical plants (ammonia or methanol) and is the major variable cost in producing the product.
  - Opportunity cost (price of competing energy at the customer level) minus cost of delivery

- **Regulation: Cost of Service (RCS):** Cost Plus – the price is determined or approved by a regulatory authority or Ministry. The level is set to recover investment and a reasonable rate of return.

- **Regulation: Social and Political (RSP)**: The Price is set by a Ministry on a political/social basis, in response to the need to cover increasing costs, or possibly as a revenue raising exercise – a hybird between RCS and RBC.

- **Regulation: Below-Cost (RBC)** – The price is knowingly set below the average cost of producing and transporting the gas often as a form of state subsidy to the population

- **No Price (NP)** – The price is either provided free to population and industry, possibly as a feedstock for chemical and fertilizer plants, or in refinery processes and enhanced oil recovery. The gas produced may be associated with oil and/or liquids and treated as a by-product.

Source: International Gas Union, 2018
Conceptual framework: natural gas pricing model architecture

Natural Gas Price (Delivered)

Internal Factors
- Gas commodity/purchase price/wellhead price
- Gathering charge/levy
- Processing charge/levy
- Transmission charge/levy
- Distribution charge/levy
- Storage charge/levy
- Regassification charge/levy
- Taxes/profit margin

External Factors
- Prices of other competitive fuels (fuel oil, crude oil) based on netback values

Source: Authors Compilation
Gas Pricing mechanisms - Conceptual framework

Compared to crude oil which has a global market, there is no single world market price for gas. Instead, there are regional markets with different pricing mechanisms.

Source: International Gas Union, 2018
Conceptual framework

- Domestic production and pipeline imports in coastal West Africa (Nigeria, Ghana, Benin, Togo and Cote d’Ivoire) is regulated on a cost of service or bilateral monopoly basis.
Analysis: landed costs of various fuels to Ghana

- Jubilee gas has the lowest wellhead purchase/commodity price among the sources (associated gas, first 200 bcf free)
- Average delivery price of WAGP gas in 2017 was $8.6/mmbtu and that of Ghana Gas was $8.8/mmbtu; Ghana gas 80% and WAGP 20% results in weighted average of $8.8/mmbtu. For 2018, PURC estimates $7.3/mmbtu as weighted average cost.
- From our analysis, the weighted average, based on 120 mmscfd (Jubilee), 75 mmscf (TEN), 30 mmscf (WAGP) and 100 mmcf (OCTP) is 6.4/mmbtu.
- OCTP developed on an integrated basis with similar cost-saving rationale as the Jubilee and TEN. OCTP field includes the non-associated gas fields Sankofa and Gye Nyame (“Sankofa Gas Field”) and the Sankofa East oil field. Bringing these significant non-associated gas reserves to market requires a high enough price to support capex and opex recovery, be it a stand-alone gas or an integrated development.
Analysis: a closer look at OCTP costs

- GSA price of US$9.80/mmbtu has been renegotiated to $7.89/mmbtu in line with indexation provisions in the contract.
- Headline gas price includes 5% gas royalties, corporate income tax, GNPC’s 20% equity share.
- Levelized net economic cost of the gas for Ghana estimated to be US$7.45/mmbtu.

Source: Adapted from World Bank (2015)
Analysis: capturing gas rents via sales margins

• Analysis indicates that the average delivered cost of gas in Ghana stands at $6.4/mmbtu compared to an average sales price of $8.8/mmbtu (2017) and $7.3/mmbtu (2018), resulting in an average gas rent of $1-$2/mmbtu over the period.

• While fields such as OCTP and WAGP pipeline imports are closer to the end user sales price, Jubilee and TEN show a margin of $3.82/mmbtu and $2.39/mmbtu respectively over the period.

• Associated gas from Jubilee and TEN are priced on a parity basis to capture gas rents as though they are coming 650 kilometres away from Nigeria and not 60 kilometres offshore.
• PURC, the regulator for natural gas prices, has stepped in by releasing for the first time in 2018 a regulated gas tariff and estimated gathering, processing and transportation charges for all gas sources in the country.

• At the same time, the previous PURC levy of $0.66/mmbtu has been reduced by 40% to $0.40/mmbtu although this is still significantly higher than West African Gas Pipeline Authority (WAGPA) administrative charge of $0.06/mmbtu
Analysis: structural non-payment risks across Ghana’s energy value chain

- **Gas will continue to offer Ghana significant cost savings**, security of supply and meet environmental benchmarks than other fuel choices.

- However, **structural non-payment issues from the inability to recoup costs of gas supplied by E&P companies** to GNPC through to GNGC for use by VRA and other IPPs in power generation poses systemic risks.

- Some projects like **OCTP partially mitigated by sovereign guarantee, MIGA guarantee and dedicated ring-fenced escrow accounts** to service gas purchases; however, the **fundamental credit worthiness of energy sector institutions need to be relooked again (domino effects).**

- **Despite floating of $2.5 billion ringfenced Energy Sector Levies Act (ESLA) Bond** using receivables from the energy sector levy, **arrears are still being accrued in the value chain.**
Way forward

Research sought to provide a concise but comprehensive assessment of gas price formation in Ghana.

1. Ghana with its gas resources is dedicated to the domestic market must face the tradeoff challenge:
   - providing investment incentives for E&P companies,
   - capturing gas rents by maximising royalties and taxes,
   - ensuring regular supply and ultimately
   - cost reductions in the critical power sector.

2. Our findings indicate that while the average delivered cost of gas in Ghana is $6.4/mmbtu, the weighted average sales price is $8.8/mmbtu (2017) and $7.3/mmbtu (2018) to power producers, resulting in significant downstream rents in excess of $1-$2/mmbtu over the period.

3. Although aspects of the gas industry are inherently monopolistic, domestic gas market price regulation with a view of accruing significant rents may not be optimal.

4. There is a need for detailed rules on price determination to be published by the industry regulator. This should particularly provide a clear economic basis for other aspects of the price make up beside the commodity charges – that is, the gathering, processing, transportation and other regulatory levies.

5. Such information would not only enlighten but help reduce potential tariff conflicts, ultimately improving consumer welfare.

6. Other benchmarking research on gas prices in several African countries and other emerging countries where gas is marketed in the domestic market show that wholesale gas prices mostly for power generation ranges from $3-$6/mmbtu.
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KD14 Darko Street
KOANS Estate, Kutunse
P.O. Box 443, Achimota, Accra, Ghana

+233 24 463 8178 | info@imanighana.com