The Critical Future of Ghana’s Energy Industry and How to Avoid More Surprises to Ghana’s Growth Prospects

IMANI Fellowship Public Lecture

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Key evolving questions for the upstream oil and gas sector

1. What is the evolution of the oil and gas industry in Ghana to date, and what are Ghana’s short to medium term energy policy priorities?

2. What are the key barriers to investment in the oil and gas industry, and what policies and institutional frameworks should be adopted to scale up investments in the current oil price environment?

3. What is GNPC’s role in Ghana’s domestic energy sector and what are the political and economic drivers likely to ensure its success given the national oil company’s core mandate?

4. How can GNPC attain its policy objectives for the next five to ten years, and how do these objectives or plans fit into the framework of its mandate regarding investments in the oil and gas sector?

5. What are the implications of the above for local content, revenue management and integrating the oil and gas industry into the wider economy?
1. What is the country’s strategy for increasing energy supply without increasing energy related input costs to production?

2. How will integrated regional gas and power infrastructure projects such as the Sankofa Gas Project in Ghana, the Songon Power Project in Cote d’Ivoire and LNG imports impact domestic gas pricing policies and the electricity tariff pricing structure including contractual commitments in securing commercially-viable offtakers?

3. What is the role of market reform and the unbundling of services including the issue of private participation in electricity distribution?

4. What is the outlook post-privatisation and the implications for economic growth?
1. Ghana’s Economic Context

2. Upstream Oil and Gas Sector
   - Oil prices and upstream investments
   - Evolution of the oil and gas industry in Ghana
   - Barriers to investment in the upstream oil and gas industry
   - Scaling up investments
   - Integrating the oil and gas industry into the wider economy

3. Power Sector
   - Demand and supply trends
   - Tariff structure and institutional setup
   - The role of gas in Ghana’s energy security
   - Regulatory framework for private investments and barriers

4. Recommendations
Ghana: Economic Context
Ghana will remain one of the fastest growing countries in SSA

Growth underpinned by improving fundamentals

- Increasing demand for natural resources
- Improvements in governance and macroeconomic management
- Rapid urbanisation and increasing domestic demand

Source: World Bank
Note: 2017, 2018 data are estimates

Growth Surge
Ghana’s GDP growth rate more than doubled in 2017

Source: World Bank and Ghana Statistical Service
Note: 2018 number is World Bank forecast
Ghana: Upstream Oil and Gas Sector
Ghana’s oil and gas industry offers good lifecycle opportunities

- Government benefits from production agreement via oil gas revenues, taxes and economic spin-offs.
- Skill development through working with partners and supply chain.
- Growth into indigenous Ghanaian companies with specialist expertise.
- International opportunities for Ghanaian workforce and specialists.
However, declining oil and gas prices have negatively impacted upstream investments.
Key milestones in Ghana’s upstream oil and gas industry

**2004-2009**
- Contracts for offshore oil production and exploration awarded
- Petroleum Exploration and Production Law 1984 (PNDC Law 84) serves as legal basis
- Jubilee Field discovered and declared commercial in 2007
- Tweneboa-Enyenra-Ntomme (TEN) and Sankofa oil fields discovered in 2009

**2010**
- Commencement of production from Jubilee Field (First Oil)
- Increased calls to set up right regulatory and institutional structures

**2011-2014**
- Jubilee production ramp-up and peaks at 110Mbpd
- Oil exports generate USD979 million of revenues in 2014
- Petroleum Commission Act 2011 [Act 821] passed to set up industry regulator
- Petroleum Revenue Management 2011 [Act 815] passed to manage resource rents
- Western Gas Corridor Infrastructure development commenced 2011 and commissioned 2015
- Local Content Regulations Passed [LI 2204] passed in 2013
- Public Interest Accountability Committee (PIAC) set up under the Petroleum Revenue Management 2011 [Act 815]

**2015-2018**
- Low oil prices impact Ghana’s economy
- Petroleum Revenue Management Act 893 (Amendment) 2015
- New Exploration and Production (E&P) Law passed in 2016 to replace PNDCL 84 but allows ministerial discretion allowing for direct negotiations in some circumstances - Exxon Mobil Contract for DWTCP
- TEN and Sankofa come onstream (2017) with production ramping up to ~170Mbpd
Higher crude oil and gas output critical to sustaining growth momentum

- Some government pledges are anchored on increasing drilling activity and meeting production targets in excess of 200Mbpd
  - ‘One district, one factory, one warehouse’
  - ‘Free secondary school’
  - ‘USD1 million per constituency per year (275 x 1 x 4 years = USD1.1 billion (~2.5% of GDP)’

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Ghana Oil and Gas Production Outlook

- Greater Jubilee Field Unit Area
- Tweneboa/Enyenra/Ntomme (TEN)
- Offshore Cape Three Points

2020 Production Target
Strategic factors affecting upstream investment decision making

- Success Criteria
  - Below Ground Factors
    - Prospectivity and Acreage Availability
  - Above Ground Factors
    - Fiscal Terms
    - Contract Terms
    - Cost Environment
    - Infrastructure and Market Access
    - Country Political Risk
Focus on revamping stalled oil and gas exploration activity while commercialising existing producing assets

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

- Shift from **direct negotiations** to **open and competitive public tendering** under the new **Petroleum (Exploration and Production) Act, 2016 (Act 919)** but **ministerial discretion** allowing for direct negotiations in some circumstances – e.g. Exxon Mobil Contract for DWTCP

- Provision of **fiscal and non-fiscal incentives to attract upstream investments**, particularly targeting larger IOCs following the derisking of Ghana’s western petroleum basin
Upstream oil and gas operations
Despite improved policy environment, barriers to investments likely to persist

Ranked 34 out of 97 jurisdictions globally, and third in Africa (out of 13 countries); PPI score better than Western Australia and Brazil (Offshore concession contracts) but investment barriers still persist

1. **Licensing**: Lack of clarity around licensing criteria and bid assessment parameters
   - Technical competence and financial capacity evaluation criteria

2. **Local content**: Supply chain contractors struggling with restrictive local content obligations
   - Technical and financial capacity of local firms to hold min 5% equity in licenses
   - Lack of skilled workforce – disparate training regime

3. **Fiscal regime**: Overall regime favourable compared to regional peers but...
   - High 12.5% royalty for new contracts vis-à-vis country’s low resource base
   - IRR-based AOE profit sharing discriminates between PAs for similar geological risks
   - AOE does not adequately capture windfall profits – e.g. w.r.t. field sizes

4. **Institutional framework**: Some overlapping mandates between government agencies – e.g. compliance and monitoring: Ghana Maritime Authority vs EPA vs Petroleum Commission
   - Framework for private investment in gas-to-power sector insufficient – no reliable offtakers

Source: Fraser Institute (2017)

Petroleum Policy Perception Index

Source: NRGI (2017)
Fiscal terms have improved and favourable compared to peers

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GNPC’s role in Ghana’s energy sector

- **Ghana National Petroleum Corporation (GNPC)** established in 1983 by (PNDC Law 64) as a *commercial strategic vehicle for state participation in the oil and gas industry*.

- The Objects of GNPC as enshrined in section 2(1) of PNDC Law 64 are: “*to undertake the exploration, development, production and disposal of petroleum.*”

- Under the **new Petroleum (Exploration and Production) Act, 2016 Act 919**, GNPC remains a partner in all Petroleum Agreements with a *minimum of 15% initial carried interest (not including Additional interest)*; permitted to *undertake petroleum activities in an open area* which is not covered by a PA; has *preemption rights* if contractor is *selling any stake*.

- However, GNPC’s performance as an NOC needs to be *benchmarked utilising a Value Creation Index (VCI):* operation performance variables, financial performance variables, and national mission variables.

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**Energy sector structure**

State-NOC relationship

**Components of the VCI**

- **Operational performance**
  - E&P production growth (%)
  - Reserves replacement ratio (%)
  - Refinery utilization (%)
  - Output / total assets (boe)
  - Output / employees (boe)

- **Financial performance**
  - EBTN / revenue (%)
  - EBTN / total assets (%)
  - Net cash flow from operations / CAPEX (%)

- **National mission performance**
  - Share of local content (%)
  - Domestic output use (%)
  - Share of national sin NOC workforce (%)
  - NOC employment share of country workforce (%)
  - Employment growth (%)
  - Non-commercial expenditure / total expenditure (%)
  - Non-core commercial net income / total net income (%)
  - Price subsidies / revenue (%)

Source: Adapted from Wolf, 2009.

Source: IHS Markit
GNPC’s many subsidiaries and investments likely to shift focus away from core mandate

The Objects of GNPC as enshrined in section 2(1) of PNDC Law 64 are: “to undertake the exploration, development, production and disposal of petroleum.”
Local content needs to move into knowledge-driven, high-value adding supply chain sectors within the oil and gas value-chain.

Source: Ernst & Young (2017)

Captive market with job creation potential.

Graph showing the capacity of local suppliers and industry spend from 2014-2024, with sectors like Well drilling services, Fabrication & Construction, FEED, Engineering & Engineering Services, Materials & Procurement, Marine operations & logistics, Transportation, supply & disposal, HSE, IT and Communication Services, R&D, Exploration, subsurface, Pet Eng & Seismic, indicated.
The Petroleum Revenue Management Act, 2011 (Act 815 as amended) passed to govern the management of petroleum revenues.

### Spending allocation of oil and gas revenues under the PRMA

1. **National Oil Company (NOC) Financing**
   - Not more than 55% of carried & participating interest

2. **Annual Budget Funding Amount (ABFA)**
   - Not more than 70% of revenue net of NOC funding

3. **Ghana Petroleum Funds (GPF)**
   - Not less than 30% of revenue net of NOC funding

4. **Exceptional Purposes Transfer**

   - All revenue accruing to the State such as royalties, carried interest, surface rentals, dividends, taxes, etc.

   - Not more than 70%

   - Not less than 30%

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**Public Investments (Capital Spending)**
- Max 25% of Public Investment Amount
- Not less than 70% of ABFA

**Consumption (Recurrent Spending)**
- Not more than 70% of ABFA

**PIAC Funding**
- Not more than 70% of ABFA

**Ghana Infrastructure Investment Fund (GIIF)**
- Spending in 12 priority areas in the absence of long-term national development plan
- Priority spending in not more than four areas in any financial year

**Ghana Stabilisation Fund (GSF)**
- Excess over cap on GSF for debt repayments

**Ghana Heritage Fund (GHF)**
- Contingency Fund and Sinking Fund
- Amount in GSF capped and reviewed by Minister and Parliament
- Excess is transferred into Contingency Fund for debt servicing
- GSF and GHF combined into Ghana Petroleum Wealth Fund (GPWF) for permanent income after resources depleted
- Support welfare of future generations once resources depleted
- ABFA funding after resources depleted shall not exceed total dividends from NOC and GPWF

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Source: Acheampong et al. for PIAC (2017)
Recommendations

**Competitive bidding for licensing rounds:**
- Establish clear bidding and evaluation criteria. Publish technical and financial proposal details.
- Actively support local companies to form JVs/consortiums.

**Fiscal Regime:**
- Urgent need to draft a new Model Petroleum Agreement
- Clarify new fiscal elements in E&P Law and syncs with Petroleum Income Tax law – i.e. bonuses, fixed royalty, acreage fees, ring-fencing provisions and loss carry forwards.

**Resolve Eastern maritime border demarcation with Togo**
- Use lessons from the Ghana-Cote d’Ivoire Maritime Border Ruling

**Institutional framework: The new E&P Law in the right direction but need to...**
- Develop sector regulations – Petroleum Regulations, HSSE Regulations, etc.
- Need to clarify roles on compliance and monitoring – e.g. HSE monitoring.

**Local content and development:**
- Operationalise the Local Content Fund
- Assist local businesses expand into service providers - JVs with foreign partners.
- More strategic capacity development programmes – e.g. Centro de Apoio Empresarial (Angola) and PROMINP (Brazil)

**Infrastructure and access to markets:**
- Pass Gas Act to give impetus to the Gas Master Plan
- Gas-to-power market investment incentives to enable gas developments
Ghana: Power Sector
Ghana’s energy sector – political and economic drivers
Energy security and access: Unreliable power is major impediment to economic growth

- **About 634 million people (32% electricity access)** in Sub-Saharan Africa without electricity (IEA, 2015).
- Most countries with appreciable access rates (>50%) have **security of supply issues** which manifest through frequent power outages.
- Most SSA countries **spend less than 3% of their GDP on power investments:** <2% as operational costs (thermal plants) and >1% for infrastructure expansion.
- **Electricity generation capacity** will need to grow at over 13% per year if SSA is to achieve universal access by 2030 (Bazilian et al. 2011).
- **Financing gap** of about **USD23 billion annually**, emphasising the need for increasing investment (Duarte et al., 2010; Kingombe, 2011).
Electrification rates and power consumption

90% urban access to electricity

67% rural access to electricity
Ghana government response to crisis

1. **Liberalisation and expansion of generation to eliminate power shortages**
   - Development of IPPs especially in thermal and hydro – sovereign guarantees, LCs, higher tariffs, BOOTs
   - Creation of regional power pools – e.g. West African Power Pool (WAPP)
   - West African Gas Pipeline (WAGP) to provide cheap natural gas

2. **Independent transmission company to manage the national transmission grid - GRIDCo created in 2006**

3. **Demand side management via energy efficiency to minimise energy waste**
   - Replacement of incandescent bulbs with CFLs
   - Public education on energy usage
   - Introduction of the lifeline tariff (subsidy for poor consumers)

4. **Expansion of the national grid to all communities**
   - 500 people in a distance of up to 20 km from an MV line (All 110 district capitals and about 2500 towns now connected)
   - Smaller communities adopting micro-scale generation (renewables) – e.g. under the SHEP (Proposed 80MW wind farm at Ada, Ghana)
Power demand and supply balance

Total generation in 2016 of 12,979 GWh (1,500 MW) vs. 3,505 average dependable and 2,448 MW average available. Peak load demand.

Total electricity required in 2017:
- 2,480-2,500 MW with VALCO at one potline.
- 3,000-3,500 MW with VALCO at two potlines.

**Hydro Power Plants - 42%**

**Thermal Power Plants - 57%**

**Renewables (Solar) - 1%**

Dependability

Total Generation (GWh)

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<th>Average Dependable</th>
<th>Average Available</th>
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The role of market reform and the unbundling of services

Note: Includes vertical integration or unbundling of generation (G), transmission (T), and distribution (D) and presence of IPPs.

Political and commercial risks in developing power markets and regional gas markets

Contractual arrangements

- Lenders
- IPP
- Direct Agreement (DA)
- Power Purchase Agreement (PPA)
- Implementation Agreement (IA)
- ECG
- Government
Political, economic and social risks in developing power markets

- Series of crisis created political opportunities for reform - e.g. move to cost reflective tariffs.
- Peak optimality at the economies of scale frontier – SOEs running the power system squeezed between declining revenues and rising costs.
- Two key elements of power market reform: raising tariffs and privatising SOEs.

**Political**
- Policy instability - regulatory uncertainty, lack of political commitment and government intervention in domestic markets (e.g. subsidies)
- Government instability – political uncertainty, contract revisions
- Obstacles in the planning process - excessive bureaucratic procedures and overlap of mandates
- Unclear arbitration procedures

**Economic**
- Access to finance – insufficient capacity addition
- Inability to recover cost of new generation via current electricity tariffs
- Inefficient fuel mix in the generation and inaccurate prioritization of investments
- Nonexistence of wholesale electricity market
- Ageing infrastructure across value chain – transmission and distribution losses
- Inflation, poor macroeconomic conditions

**Social**
- Rapid population growth and the rise of ‘megacities’
- The poverty paradox – affordability driving protests and riots
Economic growth and unreliable output from hydroelectric dams means Ghana needs to fuel power expansion

- **Ghana targeted pipeline imports from Nigeria** via the WAGP but deliveries often below contractual commitment even when pipeline was opened to other shippers in June 2014; coupled by **VRA’s inability to pay for the gas.**

- **Significant gas discoveries** offshore Ghana lessened the impetus to quickly bring LNG imports online.

- **Tano Basin has aggregate 2P gas reserves of ~ 5.7 Tcf:** Jubilee (90-120 MMscfd) + TEN (40-70 MMscfd) + Sanfoka (155-180 MMscfd) + Aker (50-100 MMscfd).

- **Domestic gas is likely to meet Ghana’s base-case** demand through the mid-2020s but need to be supplemented by LNG imports from mid-2020s (Gas Master Plan, 2014).
LNG regasification options for domestic supply will need to be competitively priced than LNG or WAGP supply

- **Ghana is progressing with three separate LNG import proposals**: Quantum Power, WAGL (Sahara Energy and NNPC), Gazprom.

- **Gazprom’s new supply agreement creates confusion over Ghana’s potential LNG terminals** as the government-backed agreement reportedly involves a new LNG terminal, despite construction already ongoing on rival Quantum Power project.

- **Main customers**: VRA and IPPs but GRA has non-payment risks (debt burden) and thus purchasing large-scale LNG volumes will have to be accompanied by government support or payment guarantees or GNPC does this on its behalf and supplies industry through its subsidiary, Ghana Gas but issue of market oversupply.

- **Key Policy Considerations**:
  - Delivered LNG price (bilateral or spot markets)
  - LNG Price Indexation
  - Regasification, transmission and distribution costs
  - FX Risk (selling in cedis or dollars?)
  - Contract Terms and Conditions – take or pay?
  - Government, levies, margins and taxes

- **Long term implications** for cost pass-through and subsidies in the power sector.

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**Chart**

**Cost of Fuel Delivered to Takoradi ($/MMBtu)**

- Associated Gas: 2.25
- WAGP: 8.00
- Non-assoc. Gas (Low): 7.00
- Non-assoc. Gas (High): 9.50
- LNG: 14.50
- LCO: 17.24

Source: World Bank staff calculations.
The automatic adjustment formula and the rising cost of electricity

Average end user electricity tariff for Ghana from 2006 to 2015 (Kumi, 2017)

Fuel generation mix likely to drive tariff increments via the automatic adjustment formula

- Automatic Adjustment Formula (AAF) aims to sustain the real value of tariffs by adjusting it based on factors such as fuel price (light crude oil, natural gas, etc), FX, inflation and generation mix.
- PURC also introduced the lifeline tariff for low income consumers
- Estimated fuel costs:
  - Combined-cycle generation: US$6.5 per kWh for gas and US$17 per kWh for LCO
  - Simple-cycle generation: US$9.5 per kWh for gas and US$26 per kWh for LCO.
  - Stand-alone diesel generators: US$40 per kWh.
  - Solar Feed-in-Tariffs (FiT): US$20 per kWh [World Bank, 2013].

Source: PURC, 2017
Will privatization be the answer to ECG’s woes?

- The biggest dimension of the debt problem in the power sector is the inability of the ECG monopoly to settle its indebtedness to VRA and IPPs.
- ECG's operations suffer from technical and commercial losses estimated at 25% of all power procured.
- ECG management also claims that government agencies, among its top customers, do not pay their bills on time.
- The 20-year Private Sector Participation (PSP), part of the USD498 million US-backed MCC Power Compact to address distribution challenges is welcome...
  - Includes 51% minimum Ghanaian private equity participation (from an initial 20%).
  - Improvement in revenue collection levels, reducing commercial losses.
  - Investments in core network infrastructure upgrades to reduce technical losses.
  - Adoption of better procurement management and working capital practices.
- However, improving the power sector’s sustainability long term requires...
  - A rigorous application of the AAF.
  - The elimination of subsidies.
  - Government settling its indebtedness on time.
  - Adopting green and smart building designs to reduce energy use (demand side load management).
Recommendations

1. **Determine energy strategy that is independent of political cycle**
   a. Develop an integrated long term energy roadmap (Master Plan) and financing strategy that offers ‘fair’ returns to all stakeholders (government, investors and end-users).
   b. Develop enabling policies across the energy value chain, particularly the gas sector – passage of the Gas Act and follow-on regulations clearly defining the roles of the sector agencies, pricing and tariffing methodology, and third party access to infrastructure to operationalise the Gas Master Plan.
   c. Gas pricing policy and regulatory framework: gas prices are yet to be specified and commercial agreements established. Any agreed commercial and regulatory framework should be stable, including predictable fiscal conditions and gas prices, for the upstream, midstream and downstream components of the gas industry.
   d. The regulatory framework to ensure cost reflective pricing and thus financial viability of entities along the gas to power value chain must be of paramount concern.

2. **Create an enabling environment for both on and off-grid initiatives**
   a. Policy support – e.g. Adopt a competitive auction system to deploy large scale solar given limited success of Feed-in-Tariffs; provide tax waivers to make local manufacturing cost effective.
   b. Alternative financing models for renewable energy.
   c. Establish an off-grid innovation and development fund.

3. **Need for innovation in the market place**
   a. Recognise the value of and promote the use of mobile infrastructure, microloans and payment solutions in supporting energy access.
   b. Distributed (on-site modular) generation can help low-income consumers and consumers in remote areas gain access electricity - e.g. Translight Solar (Ghana) and M-KOPA (Kenya)
Bottom line: Ghana's economy likely to sustain momentum over the medium term; however, the robustness of recovery depends on...

- **Ability to deliver on oil and gas** production targets.

- **Leverage oil receipts** to **grow the non-oil sector of the economy**, particularly developing value chain linkages.

- **On growth sectors: clearly mapping out the opportunities in govt industrialisation programmes** to allow private sector to favourably identify niche areas to participate in – e.g. agriculture and manufacturing chains.

- **On power sector: boost ECG’s revenue mobilisation** via concessionaire agreement while **addressing recurrent non-payment risks** in the value chain.
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