Gas Infrastructure Development in Sub-Saharan Africa
- A 20 Year Horizon -
The project methodology utilised followed six steps:

1. Identify current gas reserves and resources
2. Identify current infrastructure and demand
3. Identify planned infrastructure
4. Identify and quantify potential demand
5. Identify potential infrastructure required
6. Identify and size the opportunity that the potential infrastructure comprises

Product Scope

- Dry Natural Gas
- Liquefied Natural Gas (LNG)
- Liquefied Petroleum Gas (LPG)*
- Other Natural Gas Liquids (NGL)*
Overview of the Gas Infrastructure opportunities in sub-Saharan Africa over the next 20 years

1. **Macro-economic trends**

Sub-Saharan gas infrastructure opportunity over the next 20 years: $174 billion

Regional Ranking of countries with the largest gas infrastructure opportunities:
1. Nigeria
2. Mozambique
3. Tanzania
4. Ghana
5. Cote D'Ivoire
6. South Africa

Most common Gas infrastructure to be constructed over the forecast period:
- Transmission and distribution pipelines (Pipelines)
- Floating and permanent regasification units (Re-gasification)
- Central processing facilities
- LNG terminals
- Gas-fired Power Plants

2. **Leading LNG exporters and importers, Global, 2014**

Africa is the 3rd largest exporter of LNG and does not import any LNG

3. **Key trends and challenges facing the Gas Infrastructure sector over the forecasted period**

- *Four out of the nine countries profiled have a Gas Master plan* – A comprehensive and clear plan will aid the attraction of FDI into a country’s gas sector, and the direction of the FDI to particular projects.
- *Political stability* – Without a stable political environment the realisation of future gas infrastructure is limited and so many countries will be left with non-monetised gas resources.
- *There are three Current LNG terminals in sub-Saharan Africa* – With the exception of Cote D'Ivoire all the countries profiled require a LNG anchor project for gas development.
- *Urbanisation is driving the need for increased power* - Lagos, Johannesburg, Dar es Salaam and Nairobi are areas where domestic gas demand is expected to increase significantly over the forecasted period.
Strong economic growth in Sub Saharan Africa will need to be matched by energy investment.

**MEGA CITY**
- City With a Minimum Population of 5 Million
- Example: Luanda, Dar es Salaam, Nairobi, Alexandria, Abidjan

**MEGA REGIONS**
- Cities combining with suburbs to form regions (Population over 10 Million)
- Example: Greater Cairo, Lagos, Kinshasa

**MEGA CORRIDORS**
- Transport corridors connecting major cities or mega regions
- Example: Ibandan-Lagos-Accra Corridor, North South Corridor

**Economic Infrastructure Trends**

**African Growth Expectation**
- **High Growth (6%+)**
- **Medium Growth (3-6%)**
- **Low Growth (0-3%)**

*Time frame: 2014 – 2019; Source: IMF*

South Sudan: 9.1% over the forecast period)

**Key Takeaway:**
Most investment is expected not only within mega cities and regions, but also along major trade corridors.
Technology developments in drilling benefited Africa with 12% of Global Gas Finds

Key Takeaway:
Globally a total of 177 new discoveries were made during January and September in 2013, with 12% of the discoveries coming from Africa. East Africa benefitted the most with 11 gas finds in 2013.
Current gas Infrastructure is not sufficient to meet the growing gas demand in sub-Saharan Africa

**Key Takeaway:**
Cities experiencing rapid urbanisation such as Johannesburg, Nairobi, Dar es Salam and Lagos will drive gas adoption
Gas adoption is growing, coal and hydro still dominate as power sources over gas.

Key Takeaway:
The majority of industry and power companies still lack awareness of gas as a reliable energy source. However, in countries such as Cote D’Ivoire, gas has grown in terms of use to become the single largest energy source, while in Nigeria and Tanzania gas use is growing.
While gas has grown over the last decade, high poverty levels mean much of Africa still uses biofuels for their primary energy needs.

As a reflection of the poverty crippling the region, bioenergy use remains the main component of sub-Saharan African primary energy demand. Coal is the second largest, but has recently lost some percentage share to the benefit of oil and gas. According to the IEA, four out of five people in sub-Saharan Africa rely on the traditional use of solid biomass for cooking.

Note: Bioenergy is composed of biomass, biofuels and biogas. Solid biomass includes fuelwood and charcoal.
With low oil prices, focus is on projects with a clear value creation; legislation and gas utilisation plans are key to project attractiveness.

Key Oil and Gas Legislation, sub-Saharan Africa, 2014

<table>
<thead>
<tr>
<th>Country</th>
<th>Gas legislation</th>
<th>Trend</th>
<th>Master Plan</th>
<th>Royalties &amp; Taxes</th>
<th>Local Content</th>
<th>Free Carry</th>
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<tbody>
<tr>
<td>Nigeria</td>
<td>Y</td>
<td></td>
<td>Y</td>
<td>16-20%</td>
<td>Y</td>
<td>50%</td>
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<tr>
<td>Ghana</td>
<td>Y</td>
<td></td>
<td>Y</td>
<td>3-12%</td>
<td>Y</td>
<td>10%</td>
</tr>
<tr>
<td>Cote D’Ivoire</td>
<td>Y</td>
<td></td>
<td>Y</td>
<td>On Production</td>
<td>N</td>
<td>10-20%</td>
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<tr>
<td>Angola</td>
<td>Y</td>
<td></td>
<td>N</td>
<td>-</td>
<td>Y</td>
<td>-</td>
</tr>
<tr>
<td>Mozambique</td>
<td>Y</td>
<td></td>
<td>Y</td>
<td>6-10%</td>
<td>Y</td>
<td>10-25%</td>
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<tr>
<td>Gabon</td>
<td>Y</td>
<td></td>
<td>N</td>
<td>6-12%</td>
<td>Y</td>
<td>66-75%</td>
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<td>Cameroon</td>
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<td>5-25%</td>
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<tr>
<td>Tanzania</td>
<td>Y</td>
<td></td>
<td>Y (*)</td>
<td>12,5%</td>
<td>N</td>
<td>25%</td>
</tr>
<tr>
<td>South Africa</td>
<td>Y</td>
<td></td>
<td>N (*)</td>
<td>0,5 – 7%</td>
<td>Y</td>
<td>20%</td>
</tr>
</tbody>
</table>

Key:
- Green: Policy certainty
- Orange: Policy waiting approval
- Red: Policy uncertainty

Key Takeaway:
With the exception of mature oil and gas markets such as Nigeria, Gabon and Cameroon, in order for the gas reserves in a country to be attractive and commercially realisable timeously, the country needs to have a clear gas master plan and policy in place.
Potential infrastructure required, such as gas-to-liquid facilities & LNG plants, will support domestic gas economies

**Potential Natural Gas Infrastructure, 2015 – 2035**

Key Takeaway:
Sub-Saharan Africa plans to set up six LNG facilities for LNG export and import of gas, 2 planned new GTL facilities and two additional LNG trains at existing LNG facilities.

Four planned ring networks distributing gas within cities are also expected to be set-up, to help establish domestic gas economies for most cities.
Six countries have been identified as providing high opportunities in the sub-Saharan African gas infrastructure industry.

Gas Infrastructure: Opportunity Analysis - Final Score, Selected sub-Saharan African countries, 2015-2035

- South Sudan
- Uganda
- Kenya
- Namibia
- Ethiopia
- Congo
- Gabon
- Angola
- Equ. Guinea
- Cameroon
- South Africa
- Cote D'Ivoire
- Ghana
- Tanzania
- Mozambique
- Nigeria

Low opportunities
Medium opportunities
High opportunities
In order for gas to be a key part of the energy mix an investment in gas infrastructure of $212 billion will be required.

Gas Infrastructure: Total Potential Opportunities, sub-Saharan Africa, 2035

- SSA Pipeline Potential Opportunity: $10 billion
- SSA Gas Plant Potential Opportunity: $145 billion
- SSA Gas Power Potential Opportunity: $57 billion

Top 6 Countries Engineering & Project Mgt Opportunities = $12.6 billion

Gas Infrastructure: Pipeline, Plant and Power Potential Opportunities, sub-Saharan Africa, 2035

- $212 billion
- $155 billion
- $139 billion

Source: Frost & Sullivan