Gas Flaring In Africa

“A Critical Overview of Gas Flaring Reduction in Nigeria Oil Sector and its Challenges”

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Outline

- Global Gas Flaring Data
- Africa Oil & Gas Flare Production
- Nigeria Gas Flaring Data
- Challenges on Gas Flaring in Nigeria
- Nigeria Gas Flaring Reduction Initiatives
- Gas Flaring Reduction - Opportunities in Gas Sector
- Conclusion
150 billion cubic meters per year of flared gas is roughly equivalent to
- Gas use in all US residences for a year
- 5% of global natural gas production
- 23% of US natural gas use
- 30% of EU natural gas use
- $10 Billion lost revenue at $2/MMBtu
- 2.4 Million barrels of oil equivalent/day

Natural gas is a too valuable resource to be wasted

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Why do we flare gas?

Two main sources of flaring – continuous flaring and upset flaring

1) Upset flaring:
   - Occurs when there is a problem with a facility which is not easy to control
   - To prevent this type of flare, the plant requires integrated approach and continuous facility improvement

2) Continuous or routine gas flaring. This occurs due to:
   - Regulations not sufficient or not enforced or not in place
   - Local people lack representation / influence
   - Violence / instability within production region
   - Lack of infrastructure backbone
   - Individual field AG production rates low / uncertain
   - Price of gas is too low for commercial viability

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Estimated flared volumes from satellite data
Source: NOAA
Global flaring: 1998 - 2008

- The top 5 nations produce over 55% of the natural gas flaring.
- There was a decrease since 2005 due to Russia and Nigeria – rest of the world flaring almost flat.
- Nigeria 2007/08 reduction in flaring is due to reduced oil production.
- If Russia and Nigeria reduced flaring to the global average per bbl, it would save 35 bcma of natural gas flared.
- America / Western Europe are leading the way in flaring per bbl oil produced.
- 1998 – 2008: Global flaring down 13% from 160 to 139 BCM (oil production up from 74 to 82 mmbd).
- Biggest flare reductions in Africa.
- Flare rates in Western Europe and North America are lowest while Middle East has not changed.

Source: GE, EIA, IEA, GGFR/NOAA
Global flaring: 1998 -2008
Global Oil Production & Flaring

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### Gas Flaring Reported Sources (IEA-EIA-Cedigaz)

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Source: GE, EIA, IEA, GGFR/NOAA
An average of 7.5mmb/d or 9% of world total daily production came from Africa between 2007-2010.

Relative to the world average of 3%, production capacity growth in Africa (specifically Gulf of Guinea) is forecast to be highest at about 7% annually.
Outside Nigeria, oil players in the Gulf of Guinea namely Angola, Equatorial Guinea, Gabon, Congo and Cameroon collectively flared 10Bcm per year in 2009. This amount to 65% of the Nigeria total gas flared.

The oil production in Angola has climbed from 0.75MMb/d in 2000 to about 2.0MMb/d in 2010. 75% of this associated gas produced in Angola is being flared, this amount will be channeled to LNG export when Angola LNG becomes operation in 2012.

Gabon need to build new gas pipeline infrastructure as oil production expand in Etama region which is far from existing gas pipelines infrastructure in order to reduce flaring or use the re-injection option.

In the long term, Equatorial Guinea will be exporting their large associated gas from Alba field for the Equatorial Guinea LNG while other oil fields will still continue flaring due to lack of gas pipeline infrastructure backbone.

There is a regional opportunity due to nearest of some field from Equatorial Guinea (Bioko Island), Gabon to offshore Nigeria as a regional gas hub.
Nigeria represents about 70% of total Gulf of Guinea Oil reserves and one of major oil production country in the region in terms of supply.

Source: NNPC
Overview of Nigeria Oil Industry

- In 1908, a German company named Nigerian Bitumen Corp., began exploring for oil in Nigeria. It operated in the Araromi area, of the present Ondo State, 200 km east of Lagos. The company abandoned its dry, shallow wells there at the start of World War I in 1914.
- Shell-BP unit in Nigeria discovered oil in 1956 in commercial quantities at Oloibiri in the Niger Delta, and production began in 1958 at the rate of 5,100 b/d which was mostly exported.
- Despite major disruptions to production, the industry has been able to sustain production at within quota limits in view of the robust and diverse supply base.
- Reserves have continued to grow steadily in Nigeria. Over 7bn bbls have been discovered in the deepwater acreages bringing the total national crude oil reserves to about 35bn bbls from about 22bn bbls pre 1999. Significant scope for reserves growth still exists.
- Production capacity has peaked steadily to an installed capacity of about 2.8mmb/d in 2010.
- Over 2.0mmb/d additional capacity is planned from the shallow offshore concessions between 2006 – 2013.
- About 1.0mmb/d of additional capacity is expected from about 7 major deepwater projects.
Nigeria

- Population is the **seventh** largest in the World, ~150 million people
- The largest of any country in Africa (accounts for nearly **half** the total population of West Africa and **more than 15%** of the total population of the entire African Continent).
- Nigeria’s population is not just big but also **growing** at a very fast rate. By current population estimates produced by the United Nations, Nigeria’s population will reach nearly 230 million within the next 20 years.
- **More than 40%** of Nigeria’s population is less than 15 years old.

*In a nutshell, Nigeria has a large and energy hungry population.*

- **Proven Reserves**
  - Oil: 37 billion barrels (no. 10 worldwide, year 2010)
  - Gas: 185 trillion SCF (no. 8 worldwide, year 2010)

- **Electrical Infrastructure**
  - Electrical infrastructure not sufficient enough & Electric power supply unreliable

- **Emissions**
  - High flaring rate of produced gas

- **Government goals**
  - Reduction of flaring to 0%
  - Development of power generation & distribution sector
  - Increased domestic gas sector
  - Increased investments (by private business and oil companies)

Data: OPEC Annual Stats 2008

- 8% Shrinkage
- 20% Re-injection
- 8% to Market
- 38% to NLNG
- 26% Flared
Gas Flaring In Nigeria

- The Nigerian government and international producers have succeeded in cutting flaring by 28% from year 2000 gas flaring figure.
- Nigeria Government set zero flaring date for IOC in 2008 which was not achievable but a new zero flaring date of 2012 is unlikely achievable.
- A penalty of $10 per MMSCF was set by government as flaring penalty
- The major reduction in flaring figure were driven by investment and other factors which include:
  - Export of LNG by Nigeria LNG from year 2000 upward with strong growth from Train 1 to Train 6.
  - (The total LNG export is about 22 MTPA of LNG)
  - Higher Oil Price
  - Additional Regulatory Oversight
  - Stability in Government and Policies
Current Challenges to Gas Flaring Reduction In Nigeria

- Pricing structure
- Limited infrastructure (pipelines, gas gathering system etc)
  - Inadequate gas transmission and distribution network
- Project Funding (Government & PPP)
- Fiscal, commercial and regulatory issues
- Geo-politics
  - Inadequate Regulatory Framework
  - Harmonization of National & International Policies
  - Lack of a consistent global regulatory approach
- Immature gas and electricity market
- Ineffective Regulation
  - Strong gas flaring policies
  - Fiscal terms should encourage gas utilization
  - Right balance between incentives and penalties
- Hydrocarbon monetization priorities & commercial viability
- Production profile & volumes of gas flared
- Lack of integrated approach to gas flaring
- Offsets programs like the Clean Development Mechanism (CDM) have demonstrated limited success in respect to funding
How can gas flaring be stopped?

Infrastructure investment
- Improve facilities to minimise upset flaring
- Put infrastructure in place to link supply with demand

Aggregate supply
- Bring several AG sources together to create a larger supply

Technology improvements (mini LNG, CNG, GTL, gas-by-wire etc)
- Enable gas to be moved to market more cheaply
- Create new markets for gas (i.e. GTL to clean fuels)
- Reduce costs / increase potential revenue and so reduce the size of gas reserves required for commerciality

Regulatory changes
- Increase the cost of flaring (fines / taxes / social pressure etc.)

Most of these require finance – and in the absence of a robust local gas price, carbon finance could make a material contribution

Technology and policy solutions differ by region
INCENTIVES TO PROMOTE GAS UTILIZATION

Agreement and Act for Gas Incentives
2) Financial (Miscellaneous Taxation Provision) Act 1998
3) Financial (Miscellaneous Taxation Provision) Act 1999
4) Nigeria Liquefied Natural Gas (NLNG) Act 1990

BENEFITS OF GAS INCENTIVES INCLUDE
1) Tax Free period of 3-5 years and for NLNG 10 years
2) Reduced Tax Rate (CITA to apply)
3) Investment Tax Credit/ Allowance

N:B- Incentives cover projects such as LNG, GTL, IPPs etc
Gas Flaring Reduction Initiatives

Domestic Utilization

- Gas consumption in Nigeria may increase seven fold by end of 2015. Nigeria Domestic Market demand is growing at a projected annual rate of 25%, one of the fastest demand growth in the world.

- The domestic demand is also growing.
  - The power sector reform and the attendant government funded Gas Power Plant developments of over 10GW is driving domestic demand.

The export market is still growing

- With train 6 now operational, NLNG’s capacity has reached 22MTPA with Train 7 on course.
- Other LNG plants (Olokola and Brass) are under evaluation for FID.
- The West African Gas Pipeline Project is continuing apace and there is evidence of increasing demand.

![Domestic Gas Reserves Requirement in Tcf (2007-2026)](chart.png)
Emerging Opportunities to Reduce Flaring

Gas Revolution in Nigeria (Petrochemical)

❖ Nigeria launched the Gas Revolution: Rebirth of Industrialization agenda bound to truly reposition the country as one of industrial giant of the continent
❖ This involve the full implementation of the entire gas master-plan agenda over the next years
❖ This will result to $25 billion worth of investments in gas processing, transmission and downstream utilization projects
❖ Memorandum of Understanding (MoU) between the Nigeria National Petroleum Corporation, NNPC, and representatives of two foreign investors, namely Xenel of Saudi Arabia, Nagarjuna of India and Chevron Nigeria Limited has been signed
❖ Regional Hub: By 2014, Nigeria would have been positioned as the undisputed regional hub for gas based industries such as fertilizer, petrochemicals and methanol in sub-Saharan Africa

Central Processing Facilities
❖ About 3-4 gas processing plants are required to support growth
❖ Plants will be able to strip NGLs
❖ Plants may be tolling / merchant plants or owned by the equity owners of the gas
❖ The CPFs need to be in place by 2011/2012 when gas demand peaks
❖ Two companies, Oando Nigeria Plc and Agip Petroleum were awarded contracts for the development of the anchor Central Processing Facility, CPF, to be located in Obiafu, Rivers State and Warri, Delta State

Gas Pipeline Infrastructure
❖ Expand existing pipelines throughput capacity
❖ New proposed pipeline will link South to North, North Interconnector between East and Western grid connectors for both domestic and export purpose
❖ An gas infrastructure blueprint is will triple the gas transmission capacity in the next few years
Conclusion

- Nigeria is on the verge of real progress to eradicate gas flaring and towards actualizing growth in gas sector
- The critical success factors will be determined by
  - Good governance,
  - Better security of assets and personnel
  - Operational best practices
  - New partnerships in gas flaring reduction initiatives
  - Commitment of Nigeria government to investment
- The investment needed in the gas flaring reduction initiatives and other gas related sector requires an investment outline of about $60 billion in the next five years
- Technology is a vital tool in monetizing stranded gas and reducing gas flaring

- Africa and Nigeria in particular will require partnership from Germany government, institutions and companies to achieve both technical capability and financial support for zero gas flaring
Thank you for your attention
Back-Up slides
Global Gas Demand Growth
World Natural Gas Pricing Mechanism

- Gas Price is mainly driven by Gas To Gas Competition

Source: IGU