

Maximizing Africa's Gas Resources

PWC Africa Oil and Gas Leadership Conference

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The energy to inspire...

Outline



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1. Background
2. Maximization Framework
3. Natural Gas for Industries
4. Gas to Power
5. Gas for Exportation
6. Constraints
7. Oando Plc Overview

Background: Natural Gas

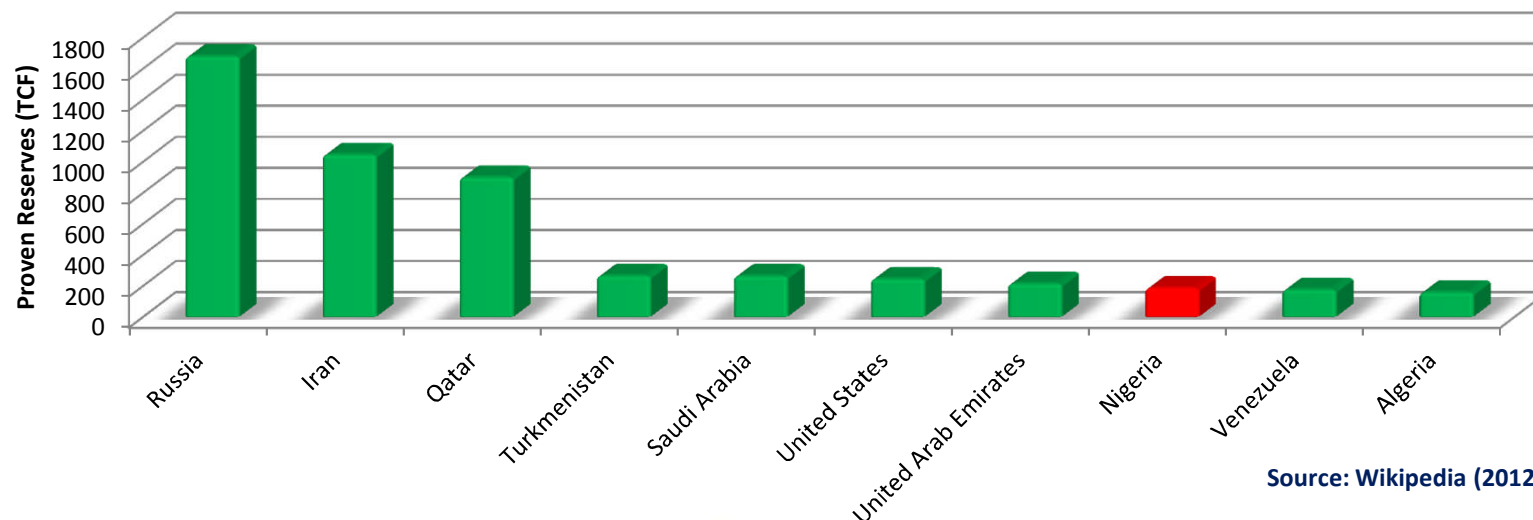


- Naturally occurring gas mixture consisting primarily of methane (CH_4), typically with 0–20% higher hydrocarbons (primarily ethane).

Types

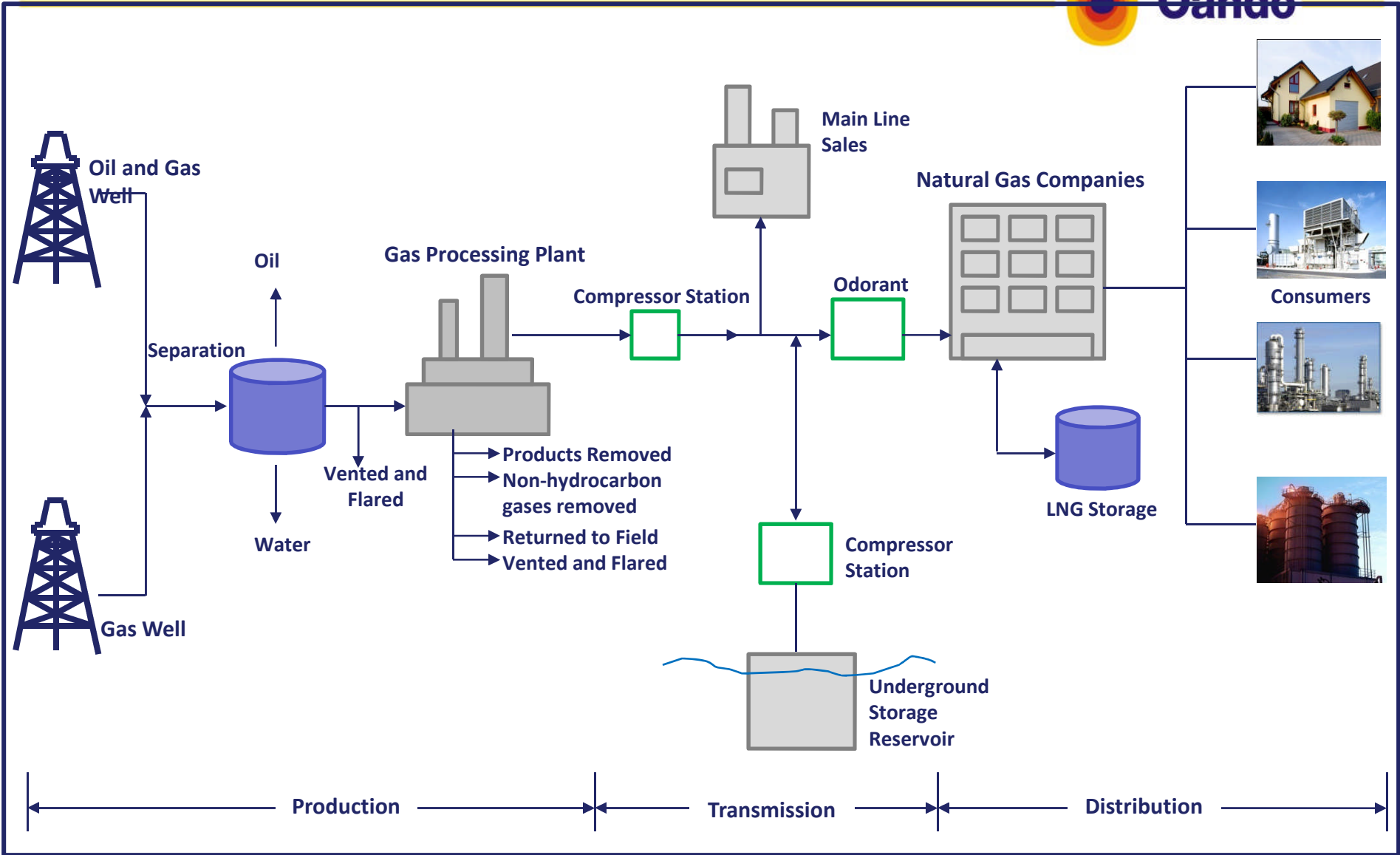
- Associated Gas – Natural gas from crude oil wells.
- Non-Associated Gas – Natural gas from reservoirs that contain natural gas and insignificant quantities of crude oil.
- Coalbed Methane – Natural gas extracted from coal beds.
- Shale Gas – Natural Gas produced from shale.

Natural Gas Proven Reserves: Top Ten Countries



Source: Wikipedia (2012 Estimates)

Background: Natural Gas Industry Value Chain



Background: Natural Gas in Africa

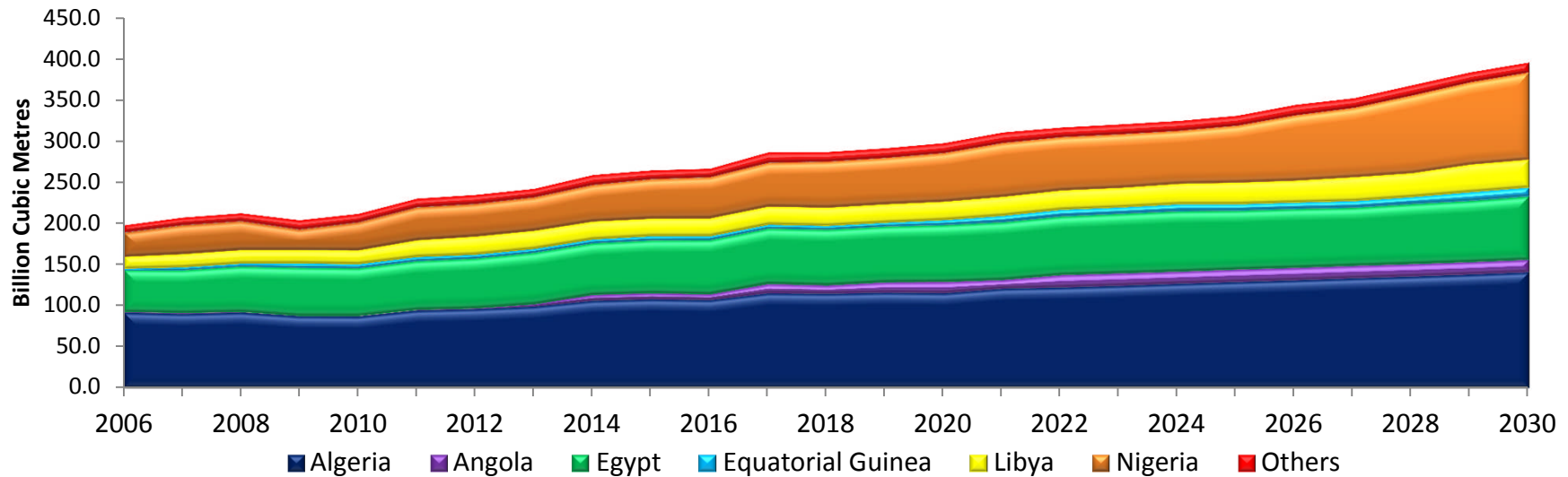


Country	Reserves (2012)	Demand (2010)	Production (2010)
Billion cubic metre			
Algeria	4,452	28.5	83.7
Egypt	2,162	45.6	60.6
Libya	1,478	6.8	16.6
Nigeria	5,053	4.9	28.7

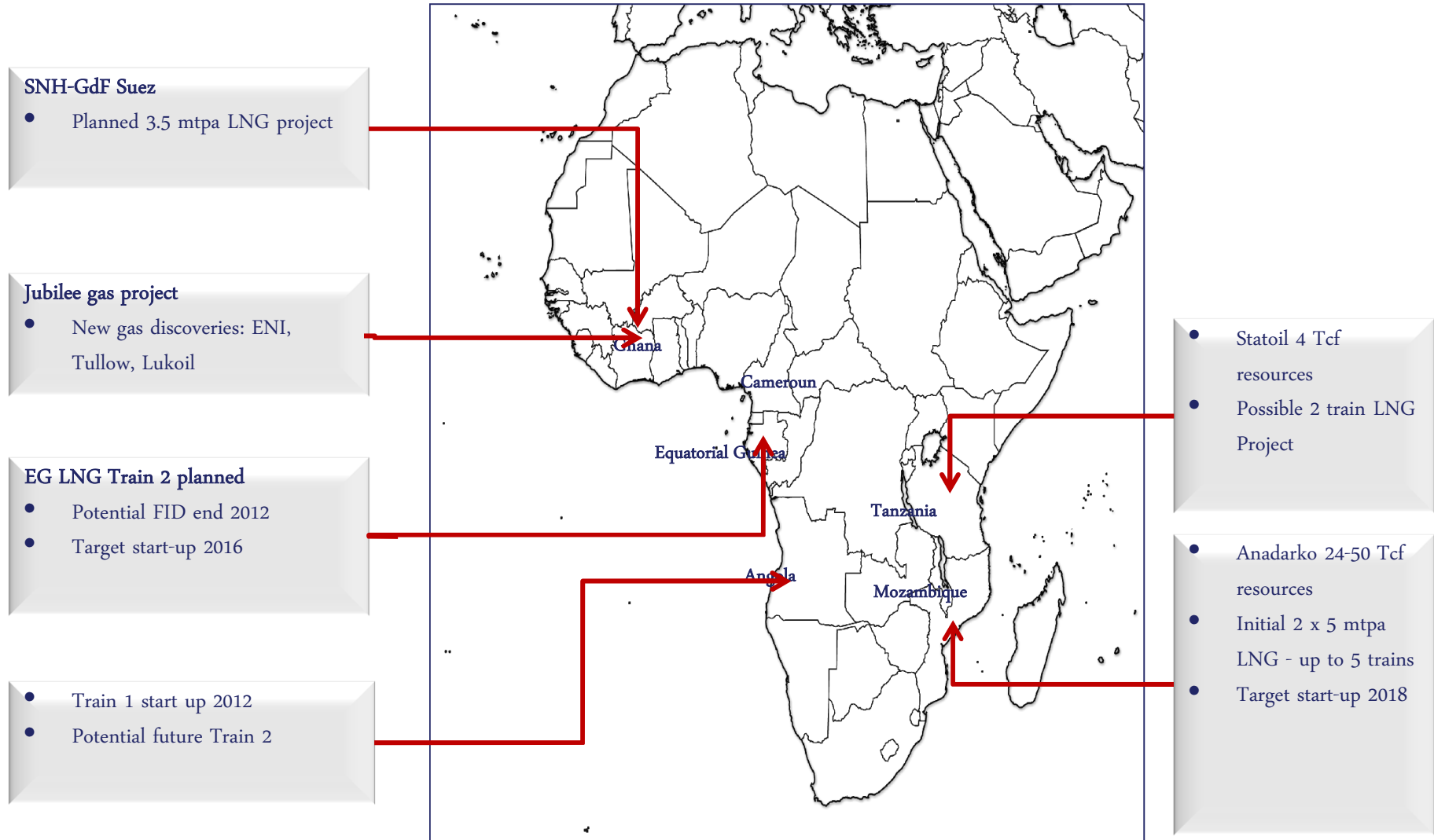
Sources: Reserves — Oil & Gas Journal
Demand/production — U.S. Department of Energy

- Proven natural gas reserves in Africa is concentrated in four countries- Algeria, Egypt, Libya and Nigeria
- These four countries account for 92% of Africa’s proven reserves of 14.2 tcm
- Recent discoveries primarily in East Africa could represent potentially transforming events for the respective economies.

Gas Production in Africa



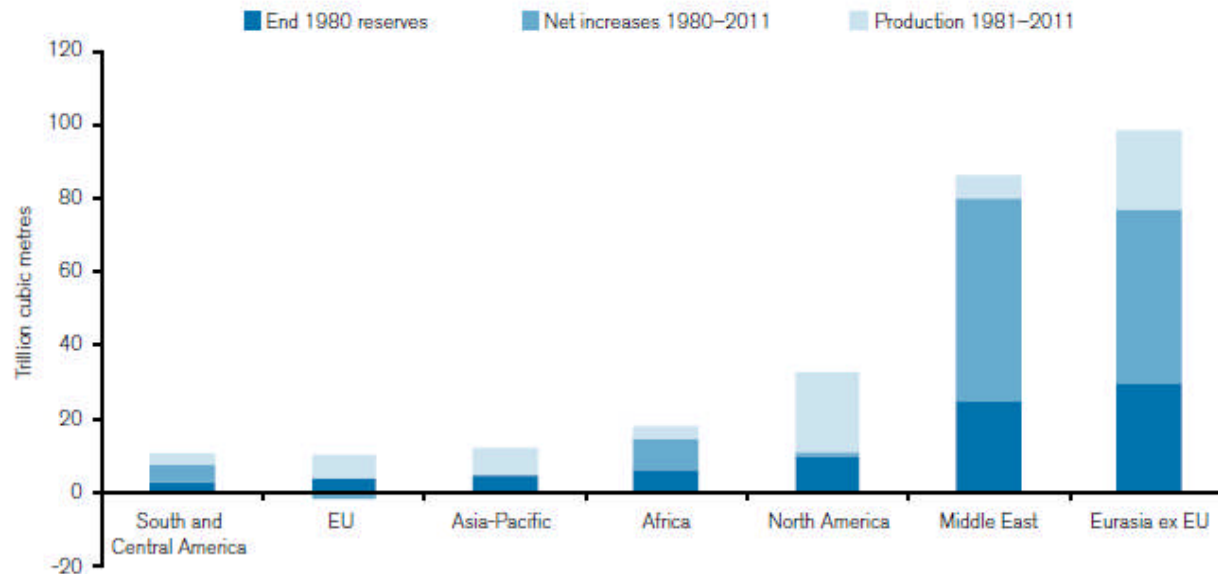
Background: Emerging Natural Gas Resources in Africa



Gas Production in Africa Vs Rest of the World



Growth in Natural Gas Reserves



Source: BP Statistical Review.

Region	Proved Reserves in 2008	Cumulative Production 2009-2030	Probable and Possible Reserves Required	Percent of Proven Reserves Used
North America	8 865	17 037	8 172	192
Europe	5 884	5 485	-	93
Asia	5 262	5 300	-	100
Asia Pacific	10 128	6 905	-	55
Latin America	7 312	4 040	-	57
FSU	57 003	19 379	-	34
Africa	14 655	6 540	-	45
Middle East	75 914	12 404	-	16
Total	185 023	77 089		42

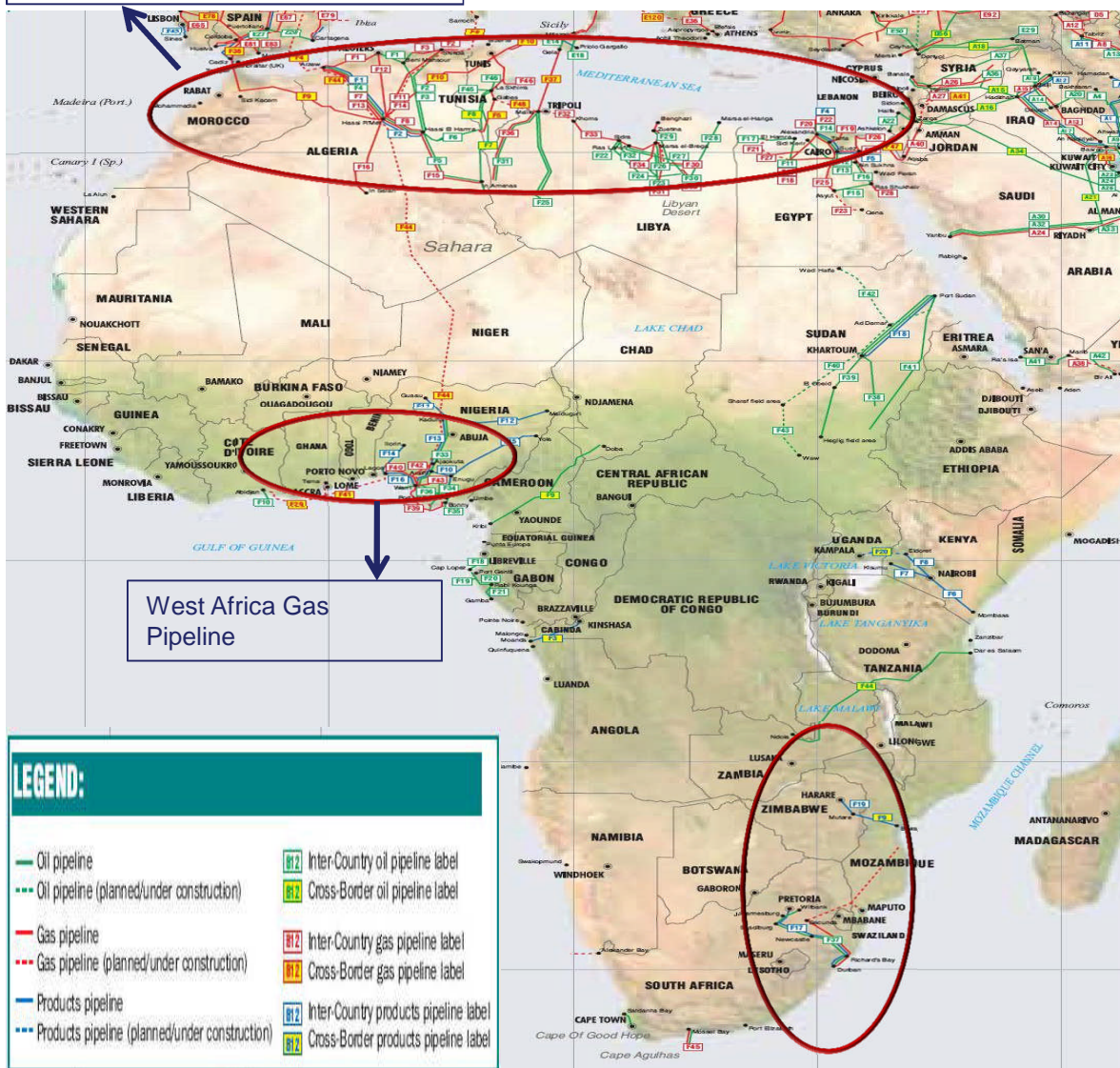
GAS CONSUMPTION IN AFRICA

- Gas consumption in Africa has been growing at a rate of about 6% per year since 2000.
- African natural gas consumption is estimated to have been about 110 bcm in 2011, with Egypt and Algeria leading consumption totals and accounting for more than 70% of the African total.

Africa Gas Pipeline Map



Concentrated in North Africa



- Gas Pipelines are concentrated in North Africa Region spanning over 4,000kms
- West African Gas Pipeline covers over 1100kms
- Trans-Sahara Pipeline (Nigeria to Algeria) is planned to be about 4,400km
- Nigeria – Ghana 1100km

Comparison with Europe



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- The network is obviously more robust

Maximization Framework



Gas Framework

Industrialization

Develop natural gas-based industries such as fertilizer, petrochemical and methanol

- Utilize gas resources for sustainable economic growth across Africa.
- Develop industries that require gas as a feedstock or for processes across the continent.

Gas to Power

Gas is currently the 2nd most used fuel for power generation.

- Focus on gas as the fuel for solving Africa's Power Problems.
- Opportunities due to continuous gas discoveries across Africa.

Exportation

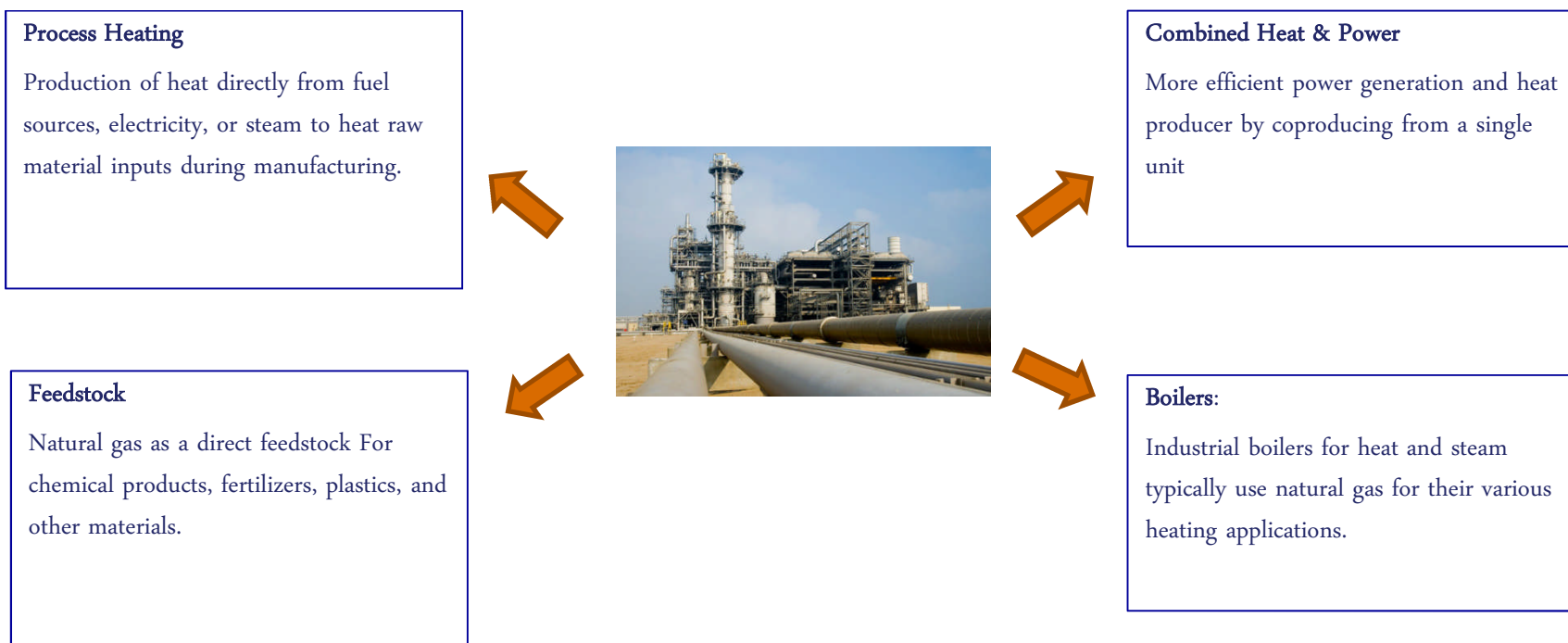
Consolidate Africa's position as a leading exporter of LNG.

- Low in-continent utilizations makes exportation primary outlet.
- 10% of global LNG supply.

Natural Gas for Industries



- Natural gas is an extremely important resource for Industrialization of any economy as it not only provides one of the cleanest burning fuels available to all segments of the economy, but also serves as feedstock for several manufacturing processes.
- Natural Gas uses in the Industrial sector include;

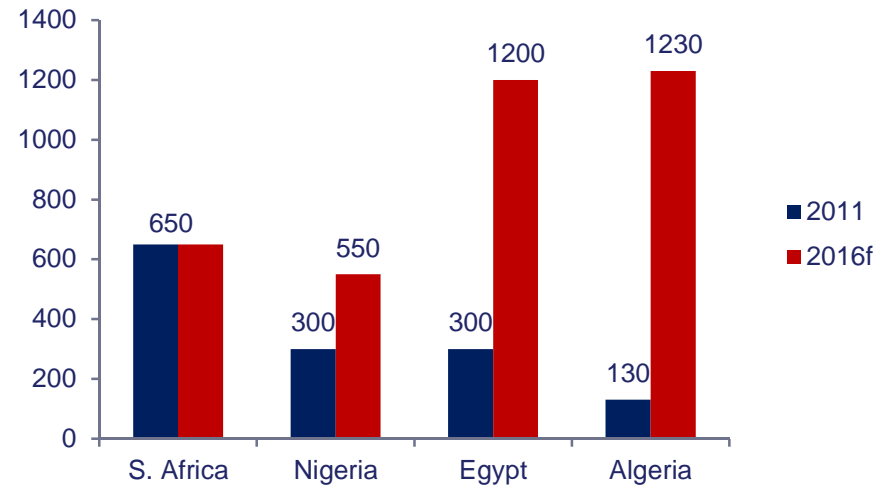
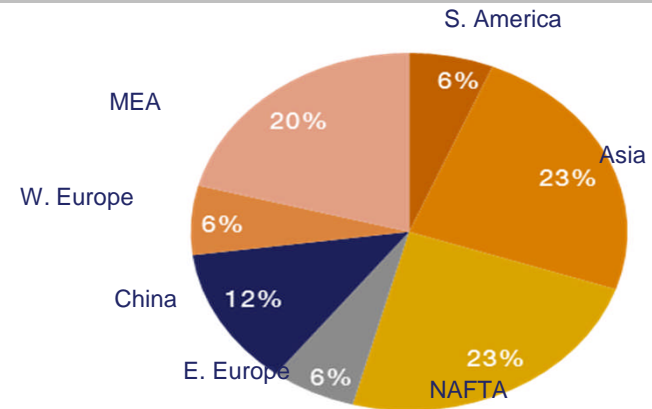


Africa's Petrochemical Industry



- Global production of 3 main products
 - Ethylene – 115 million tons per annum
 - Polypropylene – 70 million tons per annum
 - Aromatics – 70 million tons per annum
- North Africa is a major producer of ethane feedstock
- South Africa has a significant petrochemicals market accounting for half of the continent's petrochemicals revenues.
- Algeria and Egypt will be the principal contributors to growth in African petrochemicals production over the medium-term.

Global Ethylene Capacity



Natural Gas for Power Generation



- Gas Engines/Turbines are used to generate electrical power.
 - ❖ **Simple/Single Cycle Power Plants** utilize only a gas turbine for generating electricity. They can be turned on and off within minutes but have a lower thermal efficiency than combined cycle power plants.
 - ❖ **Combined Cycle Power Plants** use both gas and steam turbines to generate power. Efficiency and power output is improved by utilizing waste heat.
- Fuel cost accounts for about 65% of the cost of electricity.
- There are several opportunities for the use of natural gas for power generation in Africa as it is abundant resource and a preferred fuel for power generation globally, particularly given the severe power problems plaguing most of sub-Saharan Africa.



Natural Gas Pipeline



Gas Engine

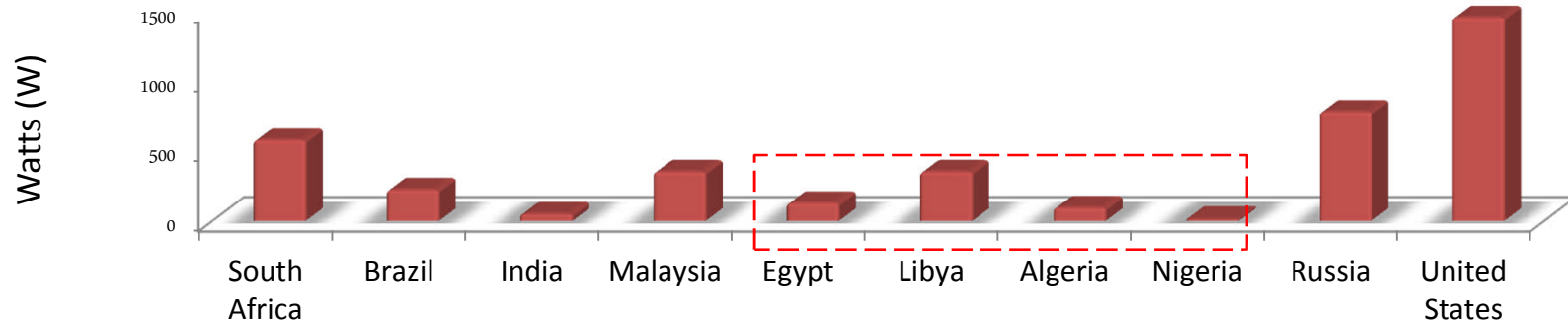


Power Generation

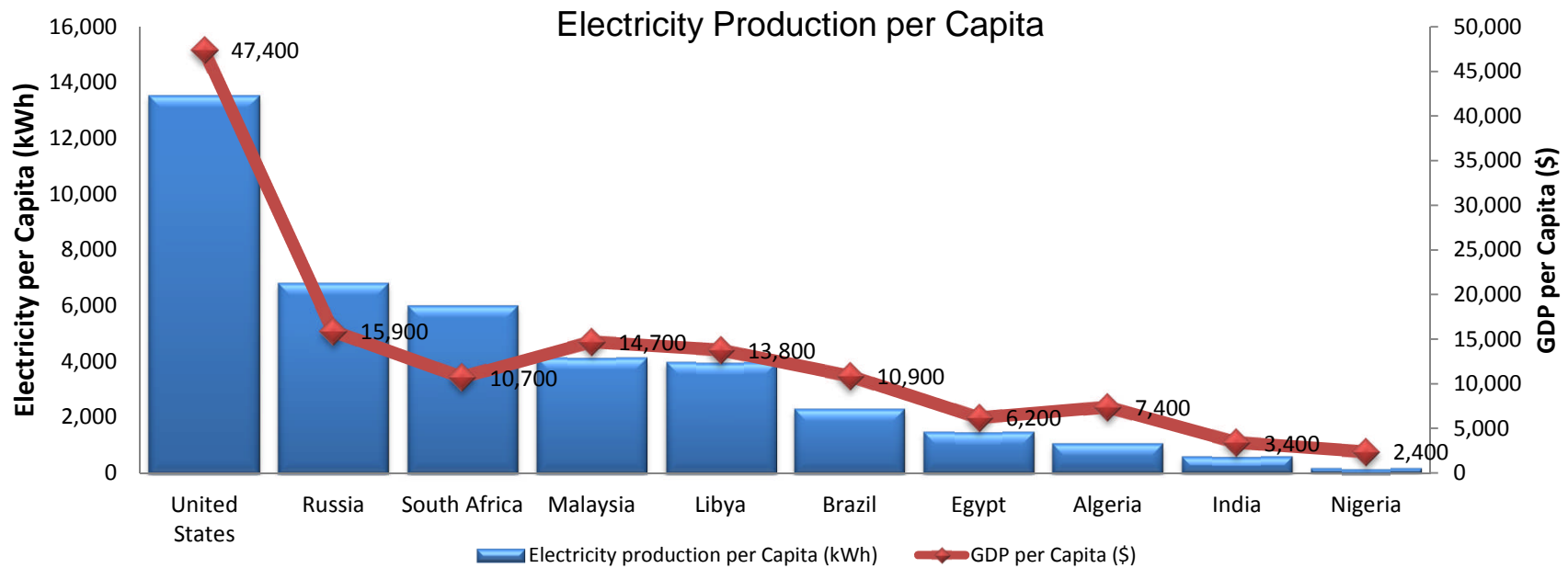
Electricity Consumption: Comparative Analysis



Average Power Consumption per Capita (Watts per Person)



Source: Wikipedia (2005+ estimates)



Source: CIA Factbook

Natural Gas Exportation



Nigeria Liquefied Natural Gas Limited (NLNG) case study

- Established in 1989 to harness Nigeria's vast natural gas resources and produce Liquefied Natural Gas (LNG) and Natural Gas Liquids (NGLs) for export.
- Nigeria LNG Limited was developed and is operated as a Joint Venture between Nigerian National Petroleum Corporation (NNPC) owning 49%, Shell Gas B.V. owning 25.6%, Total LNG Nigeria Ltd owning 15% and Eni International owning 10.4%.
- NLNG currently operates six trains with capacities of some 22 million tonnes per annum of LNG and 4 million tonnes per annum of LPG. It requires about 3.5 bcf/d feedgas intake at full production.
- Nigeria exported some 19.6 million metric tonnes of LNG last year, the fourth-largest output worldwide.

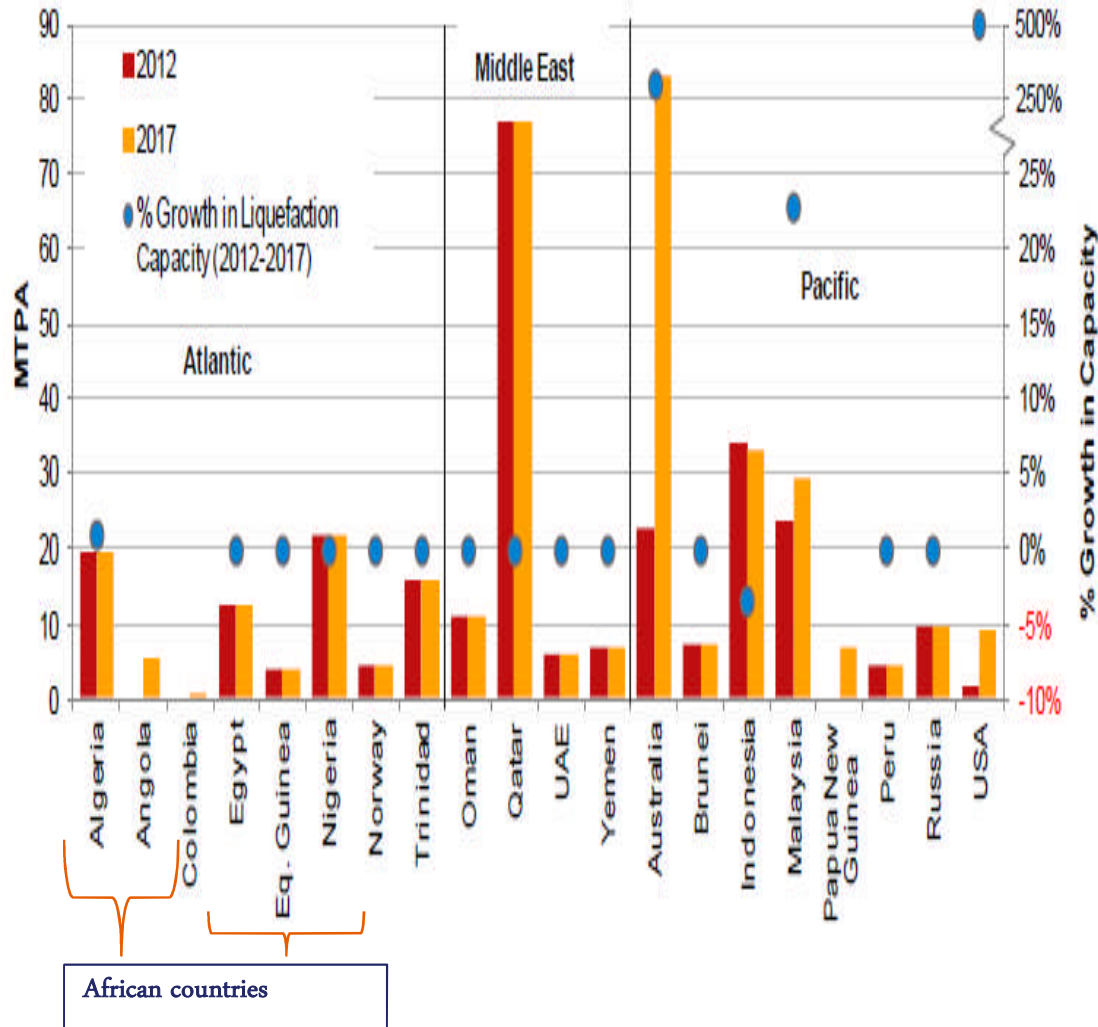
Africa's Largest Liquefied Natural Gas exporter



LNG Capacity



Liquefaction Capacity by Country in 2012 - 2017



Key Issues for Consideration

1. Will LNG Demand from Emerging Markets continue to grow?
2. Will Henry hub price become more favourable?
3. Will Japan, Korea and Taiwan rethink nuclear power?
4. Will price reforms happen in Asia?
5. Will Europe's gas Market Rebound?

If the answer to above is yes, then the LNG Capacity projected in Africa will be inadequate to meet rising demand.

Constraints



- Financing
- Infrastructure Development
 - LNG Gas trains, gas processing facilities, Pipelines & petrochemical plants
- Market & Regulatory Issues
 - Incentives to encourage infrastructure development/investments
 - Tariffs on petrochemicals product imports
 - Inadequate fiscal and gas pricing policies to encourage investments
 - Limited regional markets for gas supply (Trans-Sahara is still planned and WAGP extension)
 - Low technology and industrial base for energy consumption in domestic markets
- Sustained Economic growth in the sub-Saharan Africa
 - Lowest per capita petrochemicals consumption in the world
 - Significant potential market with increasing GDP growth
- Political Risks: Political risk looms large in the region, particularly with the Arab “long” Spring and various Inter-country tensions.

About Oando Group



Oando is the leading indigenous oil and gas player in Nigeria



OGP – Operating Assets



Gaslink (Greater Lagos)

- Main operating arm of Oando Gas & Power Limited.
- Operates a 20 year franchise to distribute natural gas in the Greater Lagos area.
- > 100 km gas distribution network with a capacity of 85 mmscf/d developed in phases.
- Network covers all the industrial areas of Lagos delivering gas to over 130 industrial customers.

Akute Power Limited (Lagos)

- Special Purpose company to build, own and operate an integrated 12.15 MW Independent Power Plant and 13Km gas distribution pipeline that will serve the major water works of the Lagos Water Corporation
- Construction completed and started operations in February 2010
- The power plant was commissioned in March 2010

Gas Network Services Limited (National)

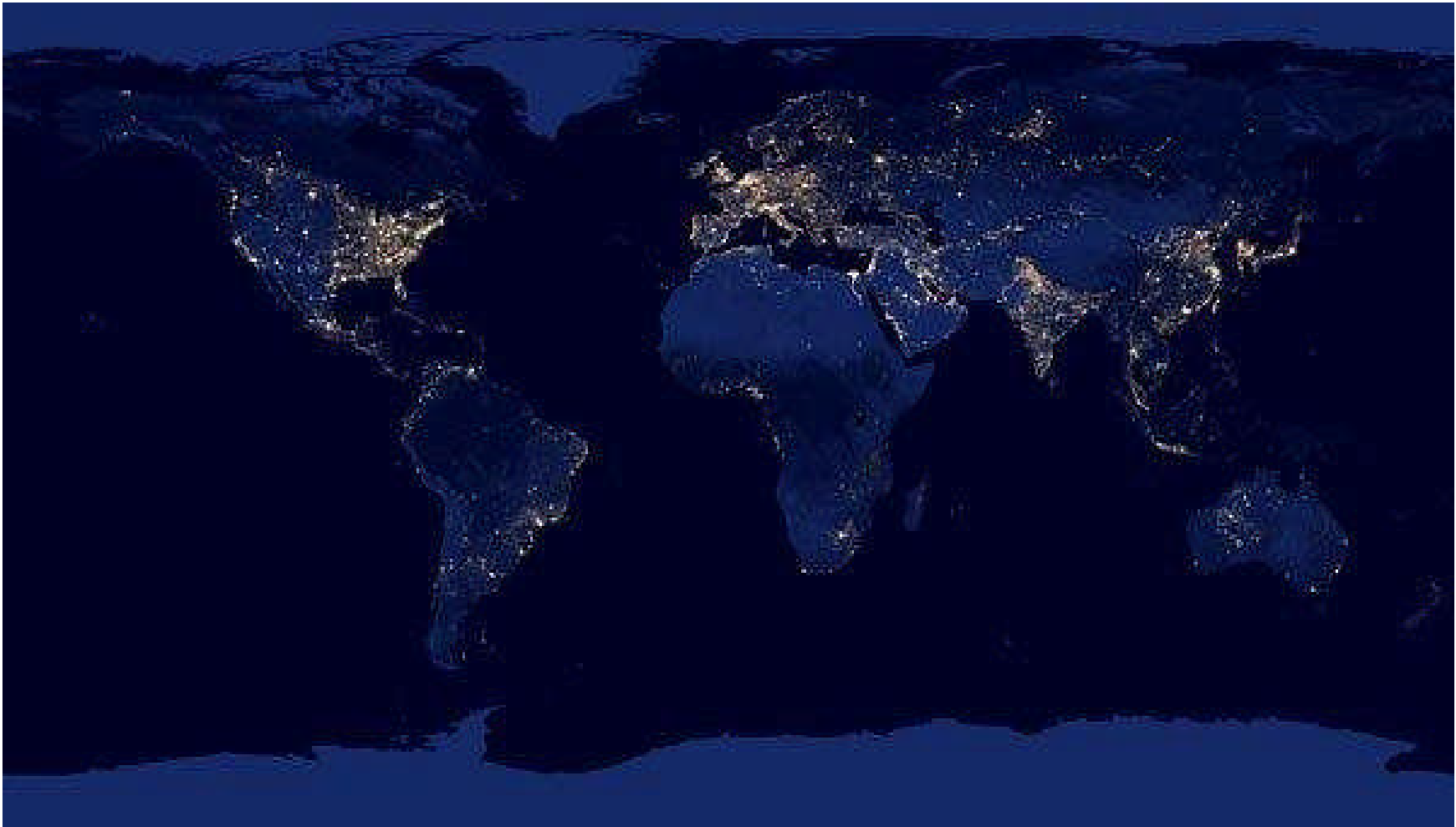
- Developing a Compressed Natural Gas plant with an initial capacity of 150mmscf/d (250mmscf/d planned).
- CNG will be transported to customers' locations using CNG tube trailers.
- The facility will also have dispensing equipment for filling of cars and buses utilizing CNG as fuel.
- The facility is expected to commence operations by 1st April 2013.

Central Horizon Gas Company (South – South Region)

- Company is engaged in the rehabilitation and expansion of the existing natural gas distribution network in the Greater Port Harcourt Area, Rivers State.
- CHGC is promoted by Oando, the Rivers State Government and TSL Logistics Limited, with Oando as the Operator of the SPV.
- CHGC began its operatorship on 3rd August 2011.

East Horizon Gas Company (South – East Region)

- Developed a 128 km gas pipeline in Eastern Nigeria spanning Akwa Ibom and Cross River States. Commissioned in Nov. 2011.
- UNICEM is anchor offtaker, and contracted for 40mmscf/d under a long-term offtake contract
- Pipeline has capacity to transport in excess of 100 mmscf/d.





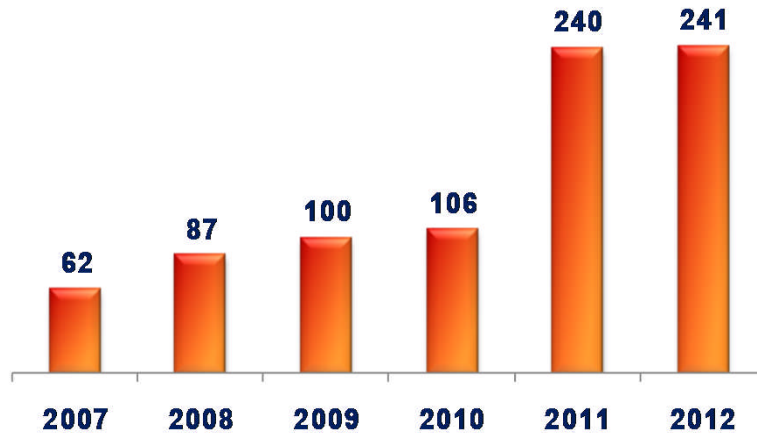
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THANK YOU

OGP – Summary Operating Data



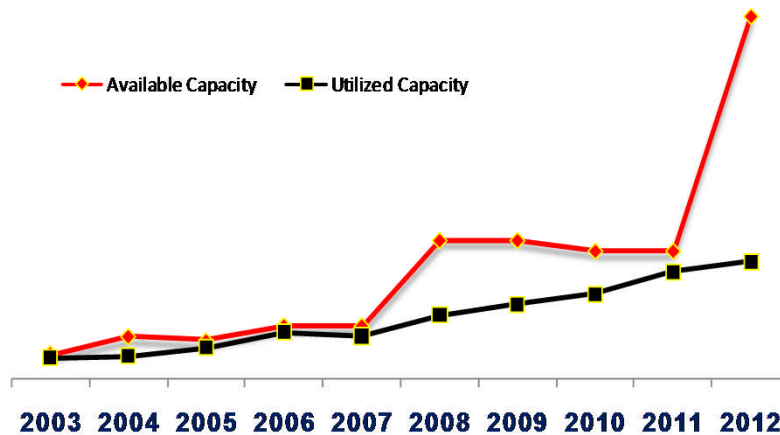
Gas Transmission Lines / Distribution Network (Km)



Number of Customers



Gas Capacity Sales Volumes/Capacity Utilization (mmscfd)



Counter-Party Quality

