Natural Gas as a Change-Bringer for Energy Sustainability

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The Increasing Importance of Gas as a Sustainable Energy Source
Natural Gas Improves Lives

- Natural gas is produced to the energy-intensive industries it powers and the homes it heats and feeds with electricity, natural gas allows for an unparalleled quality of life.

- The industry as a whole indirectly sustains over 2.2 million additional jobs in various sectors.

- Natural gas also is the feedstock for a number of industries that are the foundation of economic growth in many countries, such as fertilizers, plastics, steel and cement industries as well as seawater desalination. These industries contribute to unrivalled economy’s GDP, tax and investment funds.
Role of Natural Gas in Global Challenges

Key Global Challenges

- Population Growth & Resource Availability
- Economic Development & Employment
- Energy Poverty & Public Health
- Air Quality & Climate Change
- Mobility
- Affordability

Role of Natural Gas

- Newly Recognised Abundant Resource Base
  - conventional, deepwater & unconventional
- Industrial Feedstock
- Employment Creation
- Combat indoor pollution & urban smog
- Negligible SOx, particulates
- Low levels of NOx and CO2
- LNG for trucks and shipping
- CNG and/or electric vehicles for cars
- CCGTs as lowest cost low carbon technology
Gas is Available & Widely Distributed

Based on current demand, the world has over 200 years of natural gas available.

Source: IEA
Natural Gas Keeps the Lights On

**Natural Gas** Generating Power to the World

**Natural Gas is up to 50% cleaner than other fossil fuels**

- It emits far lower NOx, SOx and especially particulate pollutants, than other fossil fuels.
- When Natural Gas replaces other fossil fuels as a power source, air quality improves substantially, and smog clears up.*

**Natural Gas delivers the lowest capital cost per-megawatt power compared to any other source of fuel**

<table>
<thead>
<tr>
<th>Source</th>
<th>Average cost per Megawatt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced CC 400</td>
<td>$1,023</td>
</tr>
<tr>
<td>Osmotherm Plant</td>
<td>$2,213</td>
</tr>
<tr>
<td>150MW Photovoltaic</td>
<td>$3,873</td>
</tr>
<tr>
<td>Single unit IGCC</td>
<td>$4,400</td>
</tr>
<tr>
<td>Dual Unit Nuclear</td>
<td>$5,530</td>
</tr>
</tbody>
</table>

* 70% less NOx, 99% less SOx

**Natural Gas plants have much faster construction times and smaller footprints**

**They are much easier to ramp-up and ramp-down when power is needed**

**Natural Gas helps renewables grow as Natural Gas provides extra power when needed**
Natural Gas Efficiency

Natural Gas

- **Source Energy**: 100 MMBtu
- **Extraction, Processing & Transportation**: 93 MMBtu (7% Energy Loss)
- **Generation**: 92 MMBtu
- **Distribution**: 92 MMBtu
- **Delivered to Customer**: 92 MMBtu

No energy conversion necessary, therefore no energy is lost.

Electricity

- **Source Energy**: 100 MMBtu
- **Extraction, Processing & Transportation**: 95 MMBtu (5% Energy Loss)
- **Generation**: 34 MMBtu (64% Energy Loss)
- **Distribution**: 32 MMBtu (6% Energy Loss)
- **Delivered to Customer**: 32 MMBtu
Gas Applications: Egypt Case
In 2014, Natural Gas share in Egypt total Energy Consumption: 52.5%
Gas Value Chain in Egypt

Gas Delivery → Gas Grid → Local Distribution

Gas Usages:
- Power
- Fertilizers
- Industry
- CNG
- Domestic
Gas to end users

Residential
- Apartments
- Houses
- Villas

Commercial
- Hospitals
- Schools and Universities
- Offices
- Restaurants
- Bakeries etc.

Industrial
- Factories
  - Medium
    - Chemical
    - Paint
    - Textile
    - Food
  - Heavy
    - Steel
    - Cement
    - Fertilizer

Fuels substitution & conversion
- Water heating
- Space heating
- Cooking
- Steam Generation
- Furnaces
- Manufacturing Process Heat
- Refrigeration
- Gas-fired Air-conditioning

Natural gas will replace:
- Diesel for water and central heating
- LPG for heating and cooking
- Fuel oil and diesel for industrial applications
- Gasoline in cars
Africa: Overview & Potential
Africa Energy Demand Drivers

- Africa’s population is expected to reach 1.5 billion by 2030, being the highest growth rate if compared to any other continent, and almost 3 times of the World’s growth rate.

- The region median age is 20, compared with 30 in Asia and 40 in Europe.

- Africa now has the fastest-growing middle class.

- Rapid urbanisation (50% of population will live in cities by 2035)

- Over the past decade, 6 of the world’s 10 fastest-growing economies were African: USD 1.1 trillion economy at market prices, USD 1.9 trillion purchasing power, Average of USD 1,340 GDP/capita

- In the last ten years, FDI ballooned from USD 20 bn p.a. to USD 75 bn p.a.

- According to the IMF, Sub-Sahara GDP grew from USD 1.8 tn in 2011 to USD 2.7 tn in 2016 at a CAGR of 7.3% well above the World’s and MENA’s CAGR that are forecasted at 6.1% and 6.3% respectively.

Africa is moving towards being a large energy consuming society.
Africa is rich in energy resources, but very poor in energy supply. Making reliable and affordable energy widely available is critical to the development of a region that accounts for 16% of the world’s population and 20% of the planet’s total land, but only 4% of its energy demand. Almost 30% of global oil and gas discoveries made over the last five years have been in sub-Saharan Africa, reflecting growing global appetite for African resources.
Africa Energy Challenges

- Economic growth & energy poverty / access issues remain major concerns.
- Regional dynamics & global recession issues are coming as high critical uncertain issues to Africa.
- The continent has seen trade barriers, considered as uncertain issues.
- Moreover, with huge gas reserves & its new discoveries further development and prospects of LNG markets and cross-border pipelines are anticipated.
- Energy efficiency, renewable energy, energy prices and energy poverty are also viewed as requiring bold immediate actions.
- Climate change issues have been considered as a lower priority.
- Inadequate Energy Infrastructure
- Scarcity of Funds for Investments in Energy Development:
Africa Gas Outlook

**Natural Gas Consumption (BCM)**

Source: US Energy Information Administration (EIA)

- *Africa* consumption growth: 2.1%
- *World* consumption growth: 4.3%

**Natural Gas Production (BCM)**

Source: EIA

- *Africa* production growth: 1.9%
- *World* production growth: 3.4%
East Africa - Oil & Gas Potential
East Africa could supply an estimated 36 MM metric tones / Year to Asia from 2018

- 100% of Rovuma basin production will be exported initially as LNG
- The Mozambican channel is an important trade route between Africa & Asia
East Mediterranean: Major Fields
East Mediterranean: Infrastructure
“Africa, too, has no choice other than join hands to adapt and mitigate the effects of climate change. However, Africa can make a choice on how it can adapt and mitigate and when it can do so in terms of timeframe and pace. For Africa, this is both a challenge and an opportunity. If Africa focuses on smart choices, it can win investments in the next few decades in climate resilient and low emission development pathways.”

H.E. Jakaya Mrisho Kikwete, President of Tanzania
Gas: Major Player in CO² Reduction & Partnership with RE
The use of natural gas results in a significantly more limited environmental impact than other fossil fuels:

- When burned, natural gas releases up to 50% less CO$_2$ than coal and 20-30% less than oil.

- When used in power generation, natural gas emits as much as 50% less CO$_2$ than coal, results in negligible emissions of sulfur dioxide (SO$_2$), nitrogen oxides (NO$_x$), mercury (Hg), and particulates compared with other fuels.

- On-going technology developments aimed at enabling the capture and storage of CO$_2$ (CCS) further reduce emissions coming from natural gas-powered generators;

- The increased use of natural gas offers a significant contribution to improved local air quality and public health;
Natural Gas is the Cleaner Alternative

The use of natural gas in power generation provides a cleaner alternative to coal and other fossil fuels, reducing carbon and other emissions and resulting in both immediate and long-term benefits for public health and the environment.

Ontario – Canada, has implemented the largest coal phase-out program in North America, resulting in a major improvement in Toronto's air quality.
There is an urgent need to mitigate GHG emissions, including those related to energy production and consumption.

CCS is one of the most viable technologies currently available to mitigate GHG emissions from fossil fuel usage.

Although CCS from coal has generally received most attention, CCS with gas can enhance natural gas advantage of the low carbon emission.
Take decidedly clean technologies like wind or solar and the in-vogue, cheap and plentiful energy choice of the present, natural gas, and combine them to create a seamlessly operating power plant.

Existing CSPs use natural gas as a backup, but the new breed of plants is using CSPs as a supplemental fuel source.

The marriage of fossil fuels with solar has gotten worldwide attention.
Conclusion
Natural Gas is the Future

- By 2050 the world’s population is expected to reach 9 billion people, nearly a third more than today. Amidst this growth in population, alongside rising living standards, energy demand is likely to double. Meanwhile, emissions need to be reduced significantly to mitigate the most serious effects of climate change.

- Natural gas is the energy source we need to address these issues today and meet the growing global demand for energy.

- Conventional recoverable resources of natural gas are equivalent to more than 120 years of current global consumption.

- Nuclear energy is becoming an unsafe source of energy after Fukushima’s accident.

- Replacing fossil-fuels, natural gas can lead to lower emissions of greenhouse gases and local pollutants.

- Natural gas can help diversify the energy supply and so improve energy security.
Climate Change, A Lower Priority

- In Africa, hundred of millions of houses cook their food with dirty fuels like wood, dung and coal
- Household air pollution is the second biggest risk factor for death in Africa
- Household air pollution is the third biggest risk to health, causing stroke, heart disease, lung cancer, pneumonia and more

If I may address the G20 leaders:

“ It would be unethical for rich nations to demand that the world’s poor should bear the burden of lowering carbon emissions.

It’s not the cooking of the poor that threatens the climate, it is you and me who are.

... So let's help these families to connect to gas for a better quality of life ”
“Future generations will surely judge this generation of leaders not by principles they set out in communiques but by what they actually do to eradicate poverty, build shared prosperity and protect our children and their children from climate disaster.”

Kofi ANNAN, 7th Secretary-General of the United Nations
Thank you ...