FUNDAMENTAL REQUIREMENTS FOR MARKET DEVELOPMENT

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Business Development Director
Energy Dimensions in Market Development

- Engine for Economic Growth (High Correlation: Energy Consumption & GNP)
- Facilitator of Social Progress
- Key to Poverty Reduction
- Employment Generation
- Promotes Gender Equality
- Vital Input in Production (All Sectors of Economy)
- Increasingly Becoming a Need Rather than a Luxury
- Key Element for Attracting Foreign Investment
- Foreign Exchange Earner
Market development challenges

- Energy Mix
- Energy Pricing Crisis
- Supply / Demand
- Infrastructure
- Legal, Governance & Regulatory framework
- Social Impacts
## Stages of Gas Market Development

<table>
<thead>
<tr>
<th>Market Creation (0-15 years)</th>
<th>Market Development (15-40 years)</th>
<th>Mature Market (after ~40 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undeveloped gas reserves;</td>
<td>More supply options;</td>
<td>Abundant supplies;</td>
</tr>
<tr>
<td>Small market;</td>
<td>Rapid demand growth;</td>
<td>Demand saturation;</td>
</tr>
<tr>
<td>Limited infrastructure;</td>
<td>Heavy investments in infrastructure;</td>
<td>Developed infrastructure;</td>
</tr>
<tr>
<td>Integrated Structure;</td>
<td>Producers sell some gas directly to buyers;</td>
<td>Unbundled supply chain;</td>
</tr>
<tr>
<td>monopoly-monopsony operations;</td>
<td>Third party access;</td>
<td>Gas spot market;</td>
</tr>
<tr>
<td></td>
<td>Large market competition;</td>
<td>Retail competition;</td>
</tr>
<tr>
<td>Heavy regulation or state participation</td>
<td>Regulation manages competition;</td>
<td>Minimal government intervention to sustain competition</td>
</tr>
<tr>
<td></td>
<td>Assists entry of new players</td>
<td></td>
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</tbody>
</table>
Factors affecting level of development

- Political differences
- Different levels of economic development
- Non-existance of own natural gas resources
- Unavailability of foreign natural gas resources caused by their distance or a distance of supply gas pipelines
- Availability of other own / imported energy resources
EGYPT CASE STUDY
In 2014, Natural Gas share in Egypt total Energy Consumption: 52.5%
New Exploration Concession Agreements

56 new upstream Exploration agreements signed
$12 billion minimum commitment
Accelerate Existing Gas Development

- Total Investment: $21.8 bn
- Total Production: 3,600 MMSCFD
- Total Condensate Production: 86.7 MBBL/D
Egypt’s National Gas Transmission Grid

- Capacity (MCM3/D)
- Length (Km)

- **Capacity**
- **Length**

- **Total Length is 18000 Km with Capacity of 190 MM meter3/D In June 2012**
Transmission Projects

Planned Projects: $355 million

7 STORAGE TANK FOR LPG ALEXANDRIA
- 150 million pounds
- July 2017

ABU QIR DUPLICATION / DAMANHUR / TANTA PIPELINE BANHA / MOSTOROD PIPELINE
- 145 km – 16 inch
- 500 million pounds
- Q4 2017

ASSIUT / SHOUKAIR LPG PIPELINE
- 70 km – 10 inch
- 266 million pounds
- July 2016

ASSIUT / SOHAG LPG PIPELINE
- 110 km – 10 inch
- 252 million pounds
- July 2016

LINKING LPG NETWORK SUEZ TO ALEXANDRIA
- 35 km – 12 inch
- 110 million pounds
- Q3 2016

SOHAG / QENA / LUXOR / ASWAN OIL PRODUCTS PIPELINE
- 500 km – 14 inch
- 1.4 billion pounds
- July 2018
Production 2011/2012

- LPG : 1475 MT
- Cond : 39.8 MMBBL
- Propane: 605 MT
- Ethane/ propane : 437 MT

Added Value

- billion $
Projects in Refining: $9 bn

- **New Continuous Catalytic Reforming CCR (ANRPC).**
  - 490 K tons/year high octane reformate 100 octane
  - 15 K tons/year LPG $200 million Q4 2017

- **Mider Refinery Expansion.**
  - 488 K tons/year gasoline 95
  - 1.6 million tons/year Gas oil
  - 71 K tons/year LPG
  - 672 K tons/year Turbine
  - 46 K tons/year Coal
  - 33 K ton/year sulphur $1370 million Q4 2017

- **N.H.T Naphta Hydrogenation treatment Unit (ANRPC).**
  - 271 K tons/year N. Naphta
  - 121 K tons/year L. Naphta
  - 8 K tons/year LPG $45 million Sept. 2013

- **New Atmospheric Distillation unit (Ameriya Co.).**
  - 112 K tons/year LPG
  - 1744 K tons Gas oil $250 million 4th quarter 2017

- **Rehabilitation Coker Complex (Ameriya Co.).**
  - 537 K tons/year Gas oil
  - 627 K tons/year fuel oil
  - $300 million - Q4 2017

- **New Vapor Recovery Unit (Suez Co.).**
  - 48 K tons/year LPG
  - 81 K tons/year Naphtha $34.5 million Q4 2017

- **New Lubrication Oil Complex (Suez Company).**
  - 100 K tons/year base oil
  - 52 K tons/year Gas oil $500 million Q2 2018

- **New Asphalting Unit 60/70 (Ameriya Co.).**
  - 244 K tons/year asphalt 60/70
  - 88000 tons/year VGO $35 million Q4 2016

- **New Vapor Recovery Unit / Asslat Co.**
  - 122 K tons/year LPG
  - 300 K tons/year Naphtha $21 million Q2 2016

- **Continuous Catalytic Regenerative Reforming CCRA Isomerization (Asslat Co.).**
  - 606 K tons/year high-octane gasoline
  - 9000 K tons/year LPG $250 million Q2 2018

- **Full Conversion Hydrocracker Complex (Asslat Co.).**
  - 76 K tons/year LPG
  - 1049 thousand tons/year of Gas oil $2100 million - 2019

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**Total Production Added (Million Tons)**
- Gas Oil: 7.5
- Gasoline: 2.5
- Naphta: 2.2
- LPG: 0.56
Develop the Petrochemicals Industry

Projects in Petrochemicals: $9.7 bn

- **ETHYLENE / DERIVATIVES**
  - 460 KTA Ethylene
  - 400 KTA Polyethylene
  - 26 KTA Butadiene
  - $1925 million
  - Q4 2015

- **STYRENE**
  - 300 KTA Styrene
  - $580 million
  - 2019

- **PROPYLENE / DERIVATIVES**
  - 250 KTA Propylene
  - $2.5 Billion
  - 2020

- **BIO-EThANOL FROM RICESTRAW**
  - 50 KTA Bio-Ethanol
  - $227 million
  - 2018

- **AMMONIA / UREA**
  - 1.38 M T/yr urea
  - 100 KTA ammonia
  - $1925 million
  - Q3 2015

- **FORMALDEHYDE**
  - 70 KTA formaldehyde
  - $100 million
  - 2018

- **BIO-EThANOL FROM MOLASSES**
  - 100 KTA Bio-ethanol
  - $135 million
  - 2018

- **AROMATIC AND FERTILIZERS Complex**
  - 310 KTA Gasoline
  - 2.4 MT/yr Gas oil
  - 1.48 MT/yr Turbine
  - 224 KTA Propylene
  - 467 KTA Ethylene
  - $2.13 billion
  - 2020

- **POLYESTER**
  - 420 KTA Polyester
  - $262 million
  - Jan. 2014
Ensuring power generation security

**Government power generation expansion plans and reserve margin**

- **Reserve (%)**
  - 2009: 8.2%
  - 2010: 6.5%
  - 2011: 10.4%
  - 2012: 11.5%
  - 2013: 19.9%
  - 2014: 21.4%
  - 2015: 21.6%
  - 2016: 25.1%
  - 2017: 26.3%
  - 2018: 30.0%
  - 2019: 30.0%
  - 2020: 30.0%
  - 2021: 30.0%
  - 2022: 30.0%

- **MW**
  - 2009: 40,000
  - 2010: 60,000
  - 2011: 80,000
  - 2012: 100,000
  - 2013: 120,000
  - 2014: 140,000
  - 2015: 160,000
  - 2016: 180,000
  - 2017: 200,000
  - 2018: 220,000
  - 2019: 240,000
  - 2020: 260,000
  - 2021: 280,000
  - 2022: 300,000

**Generation capacity mix from 2014 to 2022**

- **%**
  - 2014: 90.50%
  - 2022: 57.00%

- **Source:** Ministry of Electricity and Renewable Energy
Gas Value Chain in Egypt

Gas Delivery

Gas Grid

Local Distribution

Gas Usages

Power

Fertilizers

Industry

CNG

Domestic
Egypt’s Strategic Rationale – LPG Price Vs NG

One LPG Bottle

EGP

95

Total Price

15

Average Customer Price

MOP Subsidy

NG Equivalent

85

10

5

10
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
Gas Midstream & Downstream Market Structure

**EGAS**

20-25Y Concession Agreement to:
Finance, design, execute, operate & maintain Gas Networks

Gov. guarantees 18% IRR for LDCs (+ O&M costs +5Y tax exemption)

**GASCO**

Manage, operate and maintain the Egyptian National Gas Grid

**Local Distribution Companies**

**EPCs**

**Agreement for:**
Gas Delivery & Metering

**Gas Supply Contract**

- Power Stations
- Industrial Factories
- Commercial Establishments
- Households
- Transportation Vehicles
Gas Distribution – Deregulation Development

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<tbody>
<tr>
<td>Pilot Project</td>
<td>National Project</td>
<td>Deregulation &amp; Expansion</td>
<td>Customer</td>
<td></td>
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World Bank – EIB Government budget

Customers charged by the cost of an LPG cylinder for each appliance to be connected to gas

Monopoly State Owned Petrogas

Foreign Contractor William Press

Monopoly State Owned Egypt Gas

5 years installments
IRR 18% guarantee (OPEX included)
Payment non convert
Cost of LPG cylinder

Monopoly State Owned Petrogas

Gas Contractor

3 years installments
NO IRR (OPEX not included)
Payment per convert

“LDC”

Customer pays 30 LE/month through bank loan

“LDC”

Customer pays over 10-15Y through bank loan

“LDC”

The Main National Grid / Trunk line is constructed & Operated by GASCO (on behalf of EGAS)
Everything down stream of the Pressure Reduction Station is within the cost of the LDC connection rate. Payments made “per converted customer”
Gas Distribution – Market Players

LDC

Overseas Gas

Maya Gas

Gas Contractor
Development of the Egyptian Gas Distribution Sector

From ONE state monopoly...

Natural Gas Residential Customers

<table>
<thead>
<tr>
<th>Year</th>
<th>Thousand Consumers</th>
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<tbody>
<tr>
<td>1981-1985</td>
<td>93</td>
</tr>
<tr>
<td>1986-1990</td>
<td>176</td>
</tr>
<tr>
<td>1991-1995</td>
<td>231</td>
</tr>
<tr>
<td>1996-2000</td>
<td>543</td>
</tr>
<tr>
<td>2001-2010</td>
<td>2,856</td>
</tr>
<tr>
<td>2010-2014</td>
<td>2,519</td>
</tr>
</tbody>
</table>

5.53 million consumers

1.043 million consumers

Promote a better quality of life for Egyptians.

600 MM $ /Year Saved in subsidies

Approx. 3.5 Million customers connected

Over 1 bn $ of Foreign & Local investment

16 Egyptian Governorates covered by Gas networks

Enhanced HSE Standards

Introducing new technologies

Attracting the Multi-Nationals

Social Investment – Jobs/Employment - Environmental

Provide a better quality of life for Egypt’s citizens
Market based Incentives: CNG Smart Card

Egypt’s Natural Gas Vehicles Sector

Egypt’s CNG Consumption in Transport

Number of CNG fuelling stations & of conversion centers

Total Converted Vehicles

CNG Fuelling Stations
Conversion centres
TotalConverted Vehicles

0 20,000 40,000 60,000 80,000 100,000 120,000 140,000 160,000 180,000 200,000

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180


Mechanism Financing 100% of cost of conversion through commercial lending on a debit card to be presented at fueling stations by converted vehicles' drivers.
Gas CNG Mobile

Image of CNG Mobile truck with tanks labeled CNG and LNG.

Diagram showing gas distribution networks with labels for 800 Km Distance and 150 Km Distance, NGV Station, CNG Racks, CNG Compression, Natural Gas Distributor, Pipeline, Hospitals, Industry Sector.
**Scope:**
- Using absorption chillers / heater units
- BOO District cooling projects
- 250,000 Ton

**Clients Benefits:**
- Saving of 30-40% of operating cost compared to electricity driven chillers
- Less building Capex & Opex
- Less Power
- Less maintenance & staffing
- Economical operating costs
- No chillers noise & vibration
- Space saving in the buildings

*District cooling consists of 3 main parts:*
Synthetic Natural Gas (LPG+Air) Distribution Network

SNG Station
LPG Tank

SNG = LPG + Air
40% Air
- Air Compressor
- Blender LPG - Air

Storage Tanks

Close – Up of SNG site

SNG Ready to use
Winning hearts and changing mindsets ...
Egypt’s Strategic Investment/Development Rationale

Egypt’s Economic Growth Vs. Energy Challenges

- Large increase in energy demand to 13% annually
- Economy growing at 7.2% before 2008 Global crisis
- Energy subsidy increased from 30 B EGP in 2004 to 100 B in 2014-2015 budget.
- National plan to convert additional 4 million customers to natural gas, to the existing 3 million
- Government need to increase Power Generation capacity from 25 GW to 75 GW by 2030

Government Solutions Creating Market Opportunities

- Egypt’s government is taking bold steps to liberalize the energy sector gradual phasing out of subsidies which is currently a burden on the budget, gradual market deregulation
- Implement and activate strong regulatory bodies
- Encourage strong involvement of private sector investment and foreign direct investment

Growing Energy Demand

- Driven by rapidly rising domestic energy consumption on the back of population and demographic dynamics, rising per capita income levels and a heightened level of industrialization, urbanization, real estate and tourism related investments, Egypt's primary energy demand continues to outpace energy supply infrastructure;
- From 2002 to 2012, oil products and natural gas consumption levels increased by 37% while electricity consumption increased by 30%. According to the Government's guidance, the former is expected to increase by 30-35% by 2015 and the latter is forecasted to increase by 37-40% over the same period after incorporating the dragging effect of the current economic slowdown.
Egypt Energy Challenges & Policy Options

- Pricing Reform:
  - Tariffs
  - Subsidies

- Institutional Restructure:
  - Integrated Energy Regulator
  - Market Liberalization (unbundling)

- Legislation Modifications:
  - New Electricity Law
  - Hydrocarbon / Petroleum Law

- Assessment & Prioritization of Energy Demand
- Security & Affordability of Energy Supply
  - LNG import
  - New & Renewable Energy Development

- Energy Infrastructure Development
- Attraction of FDI in most of the Egyptian Energy Value Chain
- Human Capacity Building & Best Practices Development
The best practice cases are thought to have benefited from:

- Long term political commitment at a high government level.
- Creation of a proper (and specialized) institutional set up.
- Creation of incentives including appropriate energy pricing schemes.
- Mobilization of sustained financial resources.
- Monitoring and measurement of results.
- Effective communication with the public.