“Establishing a viable gas energy sector in South Africa”
A viable gas sector can provide gas-to-power, as well as other industrial, transportation, agricultural and business applications. The question remains as to how to facilitate and establish a viable gas energy sector in South Africa from existing and emerging local and international gas resources, in a way that can benefit the local economy, and create jobs in South Africa in a sustainable way.
Other Nedbank / EE Publishers seminars in this series

18 Sept 2019: Establishing a viable gas energy sector for SA

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3rd Nedbank / EE Publishers Seminar

Establishing a viable gas energy sector in South Africa

18 September 2019
Outline

1. Energy policy, regulatory, planning and procurement framework
2. Context and role of gas-to-power in South Africa
Energy policy, regulatory, planning and procurement framework
The National Development Plan (NDP) 2030 identifies the need for SA to invest in a strong network of economic infrastructure. Energy infrastructure is a critical component.

The Integrated Resource Plan for electricity (IRP) and Integrated Energy Plan (IEP) develops the preferred energy mix with which to meet the electricity needs over a long-term planning horizon.

Determinations made by the Minister of Energy in terms of the Electricity Regulations on New Generation Capacity, 2011 (NewGenRegs)

The Independent Power Producer Procurement Programme (IPPPP), as managed by the IPP Office, is a key vehicle for securing electricity capacity from the private sector in terms of Section 34 Determinations for renewable and non-renewable energy sources.

Constructing infrastructure to import LNG and use viable domestic gas feedstock, mainly for power production, to diversify energy mix and reduce carbon emissions.

Energy development is informed by national policy.
Energy Planning landscape towards a diverse energy mix, at affordable prices, in support of economic growth and poverty alleviation, while taking into account environmental management requirements and interaction amongst economic sectors...

...however, implementation of aspects of energy planning, regulatory and market structure reforms is incomplete and/or in transition.
Rapidly changing energy market requiring extensive regulatory review—capable National Regulator critical in contested energy transition context

Strategies, Masterplans and Roadmaps for a just and orderly energy transition not finalized

White Paper on Energy, 1998 committed Government to a restructuring of market structures for the SA electricity supply industry, but very little has progressed in terms of energy market structure reforms
Gas planning and policy requires effective alignment across all stakeholders

• For gas market to develop, a coherent development strategy within strategic policy context is required.
  o Industrial policy should lead, while energy and other policy must align.

• Policy alignment not currently the case and greater synergy is NB.
  o Silo’s or competing objectives among departments and SOEs could result in conflict and unaffordable delays.

• Cost-effectiveness of gas requires all stakeholders to drive and implement policies and related infrastructures as a means to reduce unitary cost of fixed enabling CAPEX.
Gas-to-power procurement to be informed by promulgated IRP 2018

- As with other sources and technologies, gas procurement will be informed by final IRP once policy adjusted, gazetted and effected through ministerial determinations (and MTSAO).
- NEDLAC IRP (March 2019) indicates 1 000 MW in 2024 and 2 000 MW in 2027.
- Gas utilisation in draft NEDLAC IRP less than previous IRP iterations, with low load factors ranging between (mostly) 12% and occasionally up to 50%.
- Development of new gas infrastructure (ports, pipelines, regasification and storage) and power plants predicated on such sub-optimal gas volumes (IRP 2018).
- Inclusion ESS with updated costs, technical advances, faster deployment rates and lower GHG intensity - ESS displacing gas in IRP iterations (IRP 2018).
- However, gas still needed for long duration capacity (> 4-8 hours), until ESS and other tech with RE can help supply load 24/7.
Context and role of gas-to-power in South Africa
Why natural gas?

- Contribute to energy security, diversity and stability.
- Source for (re-)industrialisation of SA economy.
- Contributing to higher and inclusive economic growth path and job creation in SA.
- Assist SA in its journey towards achieving commitments to a lower carbon and carbon resilient future.

This is, however, a long term agenda for the next 25 or more years, but will only take place if there is commitment NOW to the development of enabling policies and for decisive action to be taken.

We have to follow a pro-active rather than a reactive approach.
• Enabling a viable gas sector encompasses more than just natural gas and can also be interpreted to include shale gas, CBM gas, UCG, LPG and even biomass and landfill gas.

• ~5% of worldwide LNG trade or 175-200 cargoes is shipped around Cape of Good Hope.

• SA’s need for gas driven by system flexibility requirements as RE penetration rises, industrial development potential, climate change mitigation imperatives and gradual diversification away from carbon-intensive coal and diesel (through gas turbine fuel conversion).

• Previous studies have estimated total potential demand for gas in SA can be up to 870 PJ (~25 bcm) by 2032. Potential developmental impacts for SA’s industrialisation could be large:
  o Gas-fired power generation alone could use > 100 PJ and add around ZAR 140 billion to GDP;
  o Industrial demand could be > 1 200 PJ, transport > 148 PJ and residential/commercial < 40 PJ.
  o At the right price, gas-based downstream industries (e.g. steel and petrochemicals) could add ZAR 110 billion to GDP and create 230 000 jobs.

• But uncertainty about demand remains as estimates vary widely among different studies.
  o Estimates can also be optimistic given developments in energy storage systems (ESS) as prospects for gas sector increasingly influenced by ESS as complementary means for RE system stability. ESS could also improve energy security in a country reliant on gas imports.
  o LNG can improve energy security in the absence of alternatives, but also risk energy security and affordability given country-reliance on imported gas under fluctuating exchange rates.

Gas-to-power IPPPPP one vehicle to stimulate viable gas market and sector in SA.
Gas prices are characterised by uncertainty

- Gas prices are volatile and USD denominated gas supply agreements can risk electricity price affordability and energy security.
- Nonetheless cheaper than diesel.
  - Replacing 10% of SA diesel (OCGTs & trucks) represents potential saving of USD 750 million p.a.
- Lower load factor suggest greater dispatch flexibility, which comes at a price:
  - Cost of flexible fuel supply/logistics.
  - Require cargo diversions/alternative buyers.
  - Cost of keeping capacity available.
- Infrastructure cost of 1 000 MW G2P @ 12% load factor (i.e. 2 cargoes p.a.) = USD 7.3 mmbtu, while 3 000 MW @ 12% load factor = USD 2.4 mmbtu.
  - 1000 MW @ 50% load factor (9 cargoes p.a.) = USD 1.9 mmbtu.
- If coordinated, greater volumes of domestic offtake entails significant cost reductions.
- G2P tariffs generally made up of capacity payment based on available capacity and variable energy payment based on dispatched energy volumes.
Status update for gas-to-power procurement

• LNG-to-power IPPPP is currently on hold until IRP 2018 has been gazetted.

  o Initial programme targeted 3 126 MW from LNG in alignment with IRP 2010 and related ministerial determination.

  o Comprehensive port studies, environmental studies, price modelling, project structuring, stakeholder engagement, etc. initiatives undertaken for gas-to-power procurement.

  o A PIM, released October 2016, envisaged procurement to be undertaken within context of wider objective of developing a gas industry in SA, including gas exploration and production from indigenous resources, encouragement of imports by pipeline from SADC and development of gas use in industrial, commercial, transportation and residential sectors. According to PIM, first phase of programme would have focused on Richards Bay in KZN and Ngqura/Coega in EC to anchor initial gas demand as well as infrastructure.

  o **Initial assumptions** for gas-to-power was for higher load factors (power plant economies) than required by current IRP capacity allocations, thus limiting gas demand for power as anchor for broader economy use. This means that the **gas-to-power programme design will have to be reviewed, including unbundled vs bundled approach**.

• Procurement informed by timeline for gas-to-power in promulgated IRP and policy direction.
G2P procurement: Considerations

• Announcement by **Minister DMRE** in July 2019 that port of **Ngqura/Coega preferred** for LNG-to-power plant, **but Transnet tender** aimed for development of LNG import terminal in **Richards Bay**.

• **Lower gas volumes will be required for electrical power generation** as indicated through lower load factors and installed MW in NEDLAC IRP vs previous iterations, as well as earlier gas requirements (2024 vs 2026 IRP August 2018), suggests **gas IPP capacity likely insufficient to justify bundled gas infrastructure procurement approach due to tariff concerns**.

• International trends moving a way from complex vertically integrated projects.

• Gas infrastructure requirements to enable gas-to-power [i.e. port, pipelines (inland, virtual and regional), regasification and storage (FSRU or inland terminal)] requires dedicated broader stakeholder involvement (e.g. Transnet, i-Gas, Sasol) with critical NB to attain readiness for commercial operations before 1 000 MW gas-to-power IRP requirement in 2024.
Mozambique would likely become one of world’s larger LNG producers with ~ 15 million tonnes/year. The uncertainty, however, is whether Mozambique will be ready to supply required volumes by 2024?

Utilising Mozambique as preferred gas source could promote regional integration, be used as another means to support a just energy transition if gas plants are located in Mpumalanga and possibly limit SA’s currency exposure through Rand-based gas supply agreements.

Total’s Brulpadda gas find in Outeniqua Basin (estimated between 300 million and 1 billion barrels of oil equivalent) could have significant consequences for SA’s energy security through a reduced reliance on imported gas when production begins.

It could take at least eight years before production begins at the Brulpadda block (2027) and has been estimated that the field could produce enough gas to fuel around 1 300 MW of baseload power in a 50% efficiency gas-to-power plant over 20 years.

**Urgency** for ensuring gas supply and related infrastructure construction to enable gas-to-power by 2024.

**Explicit and strategic policy direction, legislative amendments and determination required**

**Clear mandate for the IPPO regarding its role in overall gas sector procurement.**
Thank you
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Mott MacDonald
Andy (Andries) Calitz
Former executive at Eskom and Shell
ESTABLISHING A Viable Gas Energy Sector in South Africa

ANDY CALITZ
TWENTIETH CENTURY WAS GOLDEN ERA OF INDUSTRIAL DEVELOPMENT, ON BACK OF ENERGY SYSTEM OF COAL, OIL AND GAS
CLIMATE CHANGE AND MAN-MADE ACCELERATION OF CLIMATE CHANGE NOW DOMINATE ENERGY POLICY AND DECISIONS
THE ONGOING ENERGY TRANSITION FROM COAL, TO OIL, TO GAS, TO RENEWABLE ENERGY IS ACCELERATING
I’VE SEEN THE GLOBAL GAS INDUSTRY FROM SEVERAL PERSPECTIVES
SEEING EXTENSIVE GAZPROM GAS SUPPLY SYSTEM TO EUROPE FROM MOSCOW
SUPPLYING LNG FROM RUSSIA’S
SAKHALIN ENERGY TO JAPAN AND KOREA
SUPPLYING JAPAN, CHINA AND INDIA FROM GORGON LNG IN AUSTRALIA
POWERING CHINA, JAPAN, KOREA FROM LNG CANADA
OVERSEEING SHELL’S LARGE FLEET OF LNG CARRIERS IN THE GLOBAL FLEET OF 400
BRINGING GHG AND CLIMATE CHANGE INTO FULL PROJECT CONSIDERATION IN GORGON AND CANADA
DRIVERS FOR THE ESTABLISHMENT OF A VIABLE GAS INDUSTRY IN A COUNTRY

- Shortage of domestic coal, oil, uranium (e.g., Japan, Korea)
- Adequate domestic gas (Russia, UK, Netherlands)
- Concern for particulate/SOX emissions from coal, when available, or high CO2 emissions of coal fired power generation [twice that of gas] (China)
- Central heating in a very cold country (Russia)
- Nearby country with surplus gas resources for pipeline (Russia to Europe)
- Economic vitality to pay international LNG prices (40 importing countries)
- A tradition of cooking on gas (Asia)
- Domestic gas Government requirement for LNG export (e.g., Western Australia)
THE INTERNATIONAL ENERGY AGENCY SAYS

• Gas demand is set to growth to 2024
• Asia key to demand growth, driven by China’s push for gas
• USA leads global growth in natural gas supply and exports
• Global gas trade’s expansion is driven by LNG
• LNG investment is increasing but more needed
• Natural gas prices are converging globally
AND THE INTERNATIONAL GAS UNION SAYS GAS OFFERS THREE BENEFITS TO COUNTRIES

- Cost competitiveness
- Security of supply
- Sustainability
FOR OUR DISCUSSION TODAY THE RELEVANT CHARACTERISTIC OF ENERGY IN SA ARE ...

- Customers do not feature first on stakeholder lists of energy industry
- Coal is basis of Eskom and Sasol => major CO2 and sulphur emissions
- Eskom generation 38 years => new capacity needed
- 30 mtpa+ LNG from Mozambique will be developed => not available till ~2025
- Interfuel competition and choice, but no competition or choice in electricity
- Four rounds of renewable PPAs for IPPs, but no LNG cargo landed
- Five mega risks to energy system => uncertainty for industrialists
- SA energy imports (oil) and exports (coal) nearly in balance (energy)
- Central planning of electricity industry => slow decision making => shortages
HOW WILL WE RECOGNIZE A Viable South African Gas Sector When We See It?

- Customers/industries have choice of gas as an energy driver
- Gas market share 10-25% of primary energy
- Gas sourced from a combination of domestic (Karoo, offshore), regional (Mozambique) and international (LNG) sources
- Gas network reaches major cities, industrial centres
WHAT IS THE CENTRAL QUESTION FACING SOUTH AFRICA REGARDING GAS?

- Can economic competitiveness and environmental impact of SA economy be improved, and energy supply risk be improved by establishment of a gas industry?
- If a gas industry to be established, should it be imported or domestic gas?
- Should coal or nuclear or solar/wind or gas power the next tranche of South African power plants?
- Should a deregulated market, or continued central planning decide and answer these questions?
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Presenter 3

John Smelcer
Globeleq
Establishing a viable gas sector in South Africa – a gas utiliser’s perspective

John Smelcer

18 September 2019
The Case for Gas

- **Meeting Africa’s Growing Demand for Power**: The scale of increases in power generation required to meet Africa’s current and future energy needs is such that utility-scale non-renewable plants are a necessity - Gas-fired power provides a relatively green, flexible and cost-effective option to significantly increase generation capacity (and it complements renewables allowing the maximisation of renewables where possible)

- **Gas-Fired Power Complements an Energy Mix Increasingly Focused on Renewables**: Gas fired power a flexible and relatively green solution for addressing the intermittency of renewables while providing grid stability

- **Gas-Fired Power Will Play a Critical Role in Decarbonisation** - Gas-fired power offers significant decarbonisation benefits relative to coal, oil and wood burning.

- **Recent Discoveries Allow Gas to Power Africa’s Economic Development**

“Power stations fired by natural gas are regarded as the most market-ready solution for closing the supply-demand gaps that arise when the sun sets or during wind-still periods. Gas plants are good complements to [renewables] plants as they are able to respond immediately to variability, and they are capital-light (that is, inexpensive to build).”

-- Tobias Bischof-Niemz, CEO of ENERTRAG and author of ‘South Africa’s Energy Transition’
A Critical Bridge in the African Context – And a Longer One than Elsewhere Given Development Need

The Bridging Role for Gas

Countries with Significant Domestic Gas Resources
- These countries benefit from a relatively low domestic cost of gas, making gas-fired generation the least cost, or at a minimum a competitive, generation option
- Gas-fired generation should therefore make up a significant portion of the country’s energy mix
- Example: Mozambique

Countries Without Gas Resources
- Host countries without gas resources will likely prioritize renewables as the least cost generation option
- However, gas-fired power (made possible through imported LNG or cross-border pipelines) remains a critical complementary generation technology to address the intermittency of renewables for the system (and to meet variable demand economically) – and will continue to play this role until battery technology further evolves and reduces significantly in price
- Example: South Africa

The future of new build generation in both cases will see gas-fired power playing a significant role in host countries’ energy mixes for the coming period

What Others Are Saying

"Natural gas is a critical bridge fuel for the global transition to a low carbon future. An abundant, relatively clean energy carrier that is easy to produce, store and transport at various scales in most countries.

Demand for natural gas grew 4.6% in 2018, its fastest annual pace since 2010 [and] accounted for almost half the increase in primary energy consumption worldwide. Demand is expected to rise by more than 10% over the next five years, reaching more than 4.3 trillion cubic metres in 2024.

Renewables and natural gas together account for the great majority of the growth in primary energy. In our evolving transition scenario, 85% of new energy is lower carbon.
— BP Energy Outlook (2019)
Key Challenge to Establishing a Gas Sector in South Africa: Constraints on Gas Supply

- PetroSA offshore block depleted
- ROMPCO pipeline supply limited in the absence of additional upstream discoveries / alternative sources of supply
- Recent delays to LNG import initiatives (IPP office led procurement; Western Cape exploration of alternative model, Transnet initiative, etc.)
- Challenging regulatory (and oil price) environment for development of South Africa’s upstream potential
- Overall energy planning challenge in South Africa, particularly given viability concerns around key energy state entities – ESKOM, etc.
Yet Alternative Sources of Gas Supply Attractive and Available . . .

- Regional recent game-changing *upstream discoveries* (Mozambique, etc.)

- *LNG markets remain favorable* for new importers

- *Domestic South African upstream opportunities promising*, but long term time frame for development making them and important but medium to long term opportunity
  - Total recent offshore discovery
  - Coal bed methane
  - Karoo shale gas (despite challenges)

- *Can South Africa anchor development of these new sources of supply to establish a viable gas sector on a sustainable basis?*
Recent Game Changing Regional Upstream Discoveries

• Recent large-scale discoveries have the potential to be a game changer for individual jurisdictions and wider region
  
  o Mozambique
    • Rovuma Area 1, operated by Anadarko, current estimated recoverable gas reserves 50 tcf
    • Rovuma Area 4, operated by ExxonMobil and ENI, current estimated recoverable gas reserves 45 tcf
    • Many estimate recoverable reserves to approach 200-250 tcf in Mozambique
  
  o Tanzania
    • Area operated by Shell (also part owned by Ophir), current estimated recoverable gas reserves 11 tcf
    • Area operated by Equinor (also part owned by ExxonMobil), current estimated recoverable gas reserves 10-13 tcf
    • Many estimate recoverable reserves to approach 45-60 tcf in Tanzania
  
  o Botswana
    • Large reserves of coal bed methane (CBM) gas have been discovered in Botswana
    • The Botswana Department of Geological Survey reports that 196 tcf of "gas in place" is present in the central Kalahari Karoo Basin in Botswana
  
  o South Africa
    • Karoo Shale Gas: Estimated resources of 390 tcf, which would make it the fifth largest shale gas field in the world – though challenges for large-scale development
    • CBM
    • Active offshore block activity given proximity to other large-scale gas finds in the region – recent Total offshore discovery
Putting the Recent Discoveries in Context

• Pande & Temane total reserves = 3 tcf / Recent Rovuma finds = 150 tcf (probably 250 tcf ultimately)

• 40% of discoverable gas from 2012 occurred in Mozambique (source: Wood MacKenzie)

• Anadarko led project (to become Total-led) has taken FID on a US$23 billion basis for onshore LNG project; ExxonMobil/ENI led project to take FID 2020 for an additional ~US$20+ billion; Mozambique’s GDP in 2011 – US$12.8 billion

• Mozambique is likely to become the world’s third largest exporter of LNG, behind Qatar and Australia

• Statoil, Shell and ExxonMobil have announced plans to eventually develop an approximately US$14 billion LNG plant in Tanzania, though significant ongoing project delays

• The estimated shale gas reserves in the Southern Karoo area are at 390 tcf, which would make it the fifth largest shale gas field in the world – despite significant challenges for development

• Qatari gas reserves = 990 tcf / Recent regional finds = 800-990 tcf

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<td>2001</td>
<td>2011</td>
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<td>GDP (US$ bn)</td>
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<td>17.5</td>
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<td>GDP per capita (US$)</td>
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<td>3.6x (14% pa)</td>
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<td>Qatar Stock Exchange Market Cap (US$ bn)</td>
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<td>Banking assets (US$ bn)</td>
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LNG Value Chain

LNG Export

LNG Import
Evolution of LNG market

- Historically, a large portion of LNG volumes have been traded under long-term, fixed destination contracts

- Security of revenue enabled financing of capital intensive development of new LNG plants
- Security of supply supported development of new regasification plants
Evolution of LNG market

Shift away from the ‘virtual pipeline’ model, from A to B
LNG spot market is evolving

• Spot market LNG accounts for a quarter of LNG volumes traded
• Increase in short-term sales over last decade caused by:
  • Increased demand (e.g., Post-Fukushima demand for short-term sales)
  • Destination-free LNG supply from new US projects
  • Increase in number of market participants, including LNG traders / aggregators
  • Diversion of volumes away from Europe (cheap coal) and US (cheap domestic gas)
  • Arbitrage opportunities between Pacific and Atlantic basin
  • Increase in LNG shipping capacity
  • FSRUs encourage new market entrants
Increasing flexibility in LNG value chain – but long term contracting still prevalent

Overall trend towards shorter-term contracts, despite recent downward trend in spot trading

- However, long-term LNG SPAs remain critical to the industry:
  - Underpin the financing of new liquefaction plants (e.g., Russia; Australia; Mozambique)
  - Support the development of new regasification plants (e.g., Pakistan; Bangladesh)
African LNG Activity
Critical Bridge to Host Country Domestic Gas Utilisation or Future Regional Pipeline Supply

Greenfield LNG Projects in Africa (Export and Import)

**MOROCCO**
Government of Morocco has announced a procurement for a large scale LNG to power program

**SENEGAL / MAURITANIA**
GTA Field discovered by Kosmos and now operated by BP with recent agreement reached with Golar to implement an FLNG export project but with possible onshore applications

**COTE D’IVOIRE**
Developer: Total, Shell and Ivorian partners. Integrated LNG/gas and infrastructure FSRU import project

**GHANA**
Developer: Helios and the Ghanaian government have reached an agreement to build a LNG import terminal off the coast of Ghana in Tema.

**BENIN**
Developer: Gasol Plc. Gasol plans to regasify LNG in a leased FSRU, delivering gas to power plants and industrial users in Benin, Togo and Ghana under long-term GSAs

**EQUATORIAL GUINEA**
Developer: Ophir Energy. Fortuna FLNG forms the first phase of the proposed four-phased development of the fields discovered within Block R, offshore Equatorial Guinea – possible onshore applications

**CAMEROON**
Developer: Golar LNG, Société Nationale de Hydrocarbures and Perenco Cameroon. Consideration of an FLNG export project but with possible onshore applications

**EGYPT**
(1) Developer: Egyptian Natural Gas Holding Company (EGAS). Höegh LNG signed an LOI with EGAS for the use of one of its FSRU as an LNG import terminal in the port of Ain Sokhna (Gulf of Suez). Höegh LNG has commenced commercial operations at its Gallant FSRU vessel in Egypt
(2) Developer: EGAS. EGAS is reportedly in negotiations with foreign companies with a view to securing a second FSRU to import an additional 500 MMcf/day

**KENYA**
Developer: Government of Kenya. Government procured LNG to power project utilizing an FSRU import facility with Qatari procured gas by the government. Project on hold pending further developments

**MOZAMBIQUE**
(1) FLNG: ENI and its Area 4 partners have obtained approval for an FLNG option to monetize part of the Area 4 gas for export; ExxonMobil leading onshore LNG plans; Anadarko and partners reached FID in June 2018 for Area 1 onshore export project
(2) FRSU: Consideration of two FSRU LNG import projects in Mozambique, one in Maputo harbour and one further north

**NAMIBIA**
Developer: NamPower. Excelerate Energy will provide the FSRU and source the LNG to-power project in Walvis Bay

**SOUTH AFRICA**
Developer: Department of Energy (DoE). SA plans to import LNG via FSRU pursuant to a Gas IPP procurement program for 3000 MW of power spearheaded by the DoE with National Treasury support. A portion of the imported gas may be used for non-power utilization

African LNG Activity
Critical Bridge to Host Country Domestic Gas Utilisation or Future Regional Pipeline Supply
How do we anchor the establishment of a gas sector for South Africa? Possible catalytic projects/scenarios

1. LNG Import from international markets as a bridge to unlocking regional supply and domestic upstream potential

   **Key considerations:**
   - Anchored by Power, but potential for alternative utilisation
     - Price
     - Volume flexibility
     - Greenfield value chain risk

2. Regional delivery of gas via virtual LNG pipeline (potentially replaced by physical pipeline over time; connect to ROMPO)

   **Key considerations:**
   - Alternative pricing to international priced LNG
   - Available supply and what timeframe
   - **Relevant project:** Karpowership and Mitsui recent announcement

3. Small scale LNG, a fit for purpose solution for the African context that enables displacement of existing liquid fuel power generation

   **Key considerations:**
   - Available supply in small scale volumes?
   - Proven technology?
   - **Case Study:** New Fortress Energy in the Caribbean
     [See next slide]

4. Build gas utilisation plants in Mozambique using domestic gas obligation gas or new discoveries with export of resulting products to South Africa and world markets

   **Key considerations:**
   - Electricity: Globeleq, EDM and Sasol’s Temane 420MW CCGT project
     - Ammonia: key ingredient for fertilizer
     - GTL
Small Scale LNG
Fit for Purpose Solution for the African Context that Enables Displacement of Existing Liquid Fuel Power Generation

Key Considerations

• Virtual pipeline model; LNG as technology rather than commodity
• Anchoring small scale LNG alongside of transport and potentially in combination with renewables for off grid solutions
• Ideal for displacing HFO/diesel plants
• Small scale LNG value chain at a tipping point with players readying projects to be deployed (rapidly accelerating drop in cost of small-scale liquefaction, containerized LNG, small-scale regasification, etc.)

Case Study: New Fortress Energy in the Caribbean

• New Fortress Energy (NFE) leveraged a position in ISO containerized LNG to obtain an export license for small scale export
• NFE now supplies plants throughout the Caribbean with ISO containerized LNG, displacing HFO and diesel
• This proof of concept model is ideally suited for the African context
“Establishing a viable gas energy sector in South Africa”

A dialogue to unlock the economic and human potential of South Africa

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Jaco Human
CEO, Industrial Gas Users Association
Gas consumer needs and the establishment of a viable gas sector in South Africa
POSITION ON KEY MATTERS

The Industrial Gas Users Association - Southern Africa (IGUA-SA) is a formal non-profit association of large industrial gas users in South Africa with its main objective to ensure the efficient availability of hydrocarbon gas in Southern Africa to meet the growing demand for gas.

ACTIVITIES AND STRATEGY ARE IN LIGHT OF THE KEY ISSUES:

- Gas Availability
- Gas Policy
- Gas Pricing
MEMBERS, TOP 10 & OTHER GAS USERS

- Economic contribution/revenue
  >R150 billion/a

- Employment
  >46 000

- Combined 3rd party gas usage
  50 million GJ/a

- SME’s, hospitals, households etc
  ±8 000
GAS DEVELOPMENT TO DATE


2. **2006 – 2012**: gas energy matures; finding place in policy; shale gas potential reported; discoveries in Mozambique & Tanzania for regional trade; electricity blackouts in 2008; Eskom turns to the costly diesel OCGT

3. **2013 – 2018**: global development of LNG markets; Mozambique LNG took off with Rovuma development; >USD128 billion investment between 2017 and 2029; gas prices change from long to short term contracts attracting new buyers globally; SA announced various programs from around 2012 for gas growth in energy mix & GUMP; SA State was not to act nor execute on any gas policy soon due to focus on nuclear; period of stagnation; downscaling of international gas majors’ presence in SA

4. **> 2018**: characterized by gas energy shortages; limited or no gas pipeline & receiving infrastructure in South Africa; significant increases in gas cost for users; policy uncertainty as to the future role of gas in SA’s energy mix & timing; gas energy insecurity amidst dwindling Sasol supply
KUDU
- Discovered 1974
- ±1,3tcf
- Anchored on GTP & power exports that is not materializing
- Longest sub-sea tie in
- Economic feasibility and development unclear
PetroSA Block 2A
• Discovered 1987
• ±1,5tcf
• PetroSA 24% stake
• Economic feasibility unclear & development unlikely
Blocks 9 & 11
- Owned by PetroSA
- Block 9 feedstock for Mossgas since 1992
- Virtually depleted with some 230mGJ
- Mossgas operating below capacity
- 2015 drilling campaign unsuccessful
- PetroSA also owns block 11 with limited gas ±590mGJ & unlikely to be developed

Block 11B Brulpadda
- Total (45%)(QP25%) announced in 2019 significant gas condensate prospects
- Outeniqua basin, 175km’s off shore
- Depths up to 3700m
- Next steps: additional drilling & 3D seismic
- Early exploration phase with 10y window
KAROO SHALE GAS

- Estimates uncertain & environmentally controversial
- Reserves previously estimated at dazzling 485tcf, but more likely to be 13tcf
- Shell confirmed 2017 the unlikelihood for development beyond exploration
- Economic feasibility uncertain
- Even with development, gas only likely beyond 2035 due to requirement for infrastructure, water and supply chains
MAMBA / LESEDI
- Coal bed methane reserves
- ±200mGJ
- Concession owned by Tlou Energy
- August 2019 announcement confirms steady flow of gas to be anchored on small localized GTP
VIRGINIA
- Renergen/Tetra4 development
- Small quantities CNG since 2016
- Small LNG facilities to supply up to 2,3mGJ/a by 2023
- Target market displacement of liquid fuels
- August 2019 announcement for development of underlying helium resource
ROVUMA AREAS 1 & 4

- Investment to reach ±USD128 billion by 2029
- Total/Anadarko; Area 1; 63tcf
- ENI; Area 4; 58tcf
- Coral offshore platform first gas 2022 destined for Asia
- Total/Anadarko FID June 2019 for 2 LNG train development; 12mt/a; 2022 available; 11mt/a contracted
- BP to distribute LNG off Coral around Southern African coast?
- Pipeline connection to Rompco at 1700km; 24’; CAPEX at USD4-8 billion
- Feasible > 400mGJ/a
- Readiness > 2030
- Long term target project for SA users?
ZAMBESI / ANGOSHE

- 5th licensing round
- ENI & ExxonMobil
- Early exploration with 10 year plus window
- 3-5tcf potential
- Economically most attractive for gas supply to SA
- Potentially stranded gas
- Requirement for ±775km pipeline into Rompco
- Long term target project for SA users?

SUPPLY - NATURAL GAS MARKET DYNAMICS
PANDE / TEMANE
- Sasol owned, under PPA with GoM
- Supply since 2004; 167mGJ/a to SA; 30mGJ/a to Moz
- ±800mGJ left with reducing pressure
- Gas declines from 2023 at 7.5%/a; thereafter at 15%/a
- Two mitigation projects i.e. CIP; PSA
- FID June 2020 for CIP est. USD500million
- PSA gas availability ±725mGJ for Moz GTP
- Refer graphic
SUPPLY - PANDE/TEMANE DEPLETING GAS

Volume decline post 2023

Years

2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031

Giga-Joule per annum

190 → Million

Supplementary projects already commenced

Sasol Gas Volumes PPA
Sasol Project 1 Infilling and compression project
Sasol Project 2 Production Sharing Agreement (PSA)
Supplementary gas supply requirement
SUPPLY - NATURAL GAS MARKET DYNAMICS

GAS TX SURPLUS CAPACITY

- Rompco (CPF to Secunda) – 16mGJ/a
- Lily (Secunda to Durban) – 7mGJ/a
- SWM (Mpumalanga) – 7mGJ/a
- GNP (Secunda to Sasolburg) – 9mGJ/a
- GNT (Gauteng) – 44mGJ/a
LNG IMPORTS TO SUPPLEMENT SHORTFALL

- Estimated shortfall of 98mGJ/a average from 2025 – 2030
- Plus growth demand?
- Coega as per DMRE of no consequence to current user base
- Saldanha not to be ignored, but also of no consequence to current user base
- R/Bay and Maputo LNG only viable options each with distinctive implications for gas cost, time horizon, network capacity utilization, risk.
RICHARDS BAY LNG IMPORTS

- Transnet development
- FSRU/FSU plus downstream distribution models (pipeline and/or rail)
- Prefeasibility stages
- Investment at USD1-2billion including new TX pipeline?
- Feasibility and readiness unconfirmed
- Could potentially benefit KZN/inland for additional 20mGJ/a in Lily; inland by additional 20mGJ/a of MRG replacement

MAPUTO LNG IMPORTS

- Recently announced by GoM
- Private sector development
- Two concessions (unlimited gas imports/sales; unlimited power selling)
- Allows for FSRU and 2000MW GTP
- 89km link to Rompco at USD100million
- 2022 readiness
- Minimum volume 50mGJ/a
- Could benefit KZN for additional 7mGJ/a on Lily; inland by additional 16mGJ/a on current TX network
DEMAND (EXCL SASOL) - NATURAL GAS MARKET DYNAMICS

**GP – current & GTP**

**KZN – current & GTP**

**WC – current & GTP**

**SA – current & GTP**
What is SA Inc’s reality?

- Gas energy crunch already a reality – worst yet to come and that on top of electricity insecurity and cost
- No entity currently has concrete plans to meet SA’s gas energy challenge in time
- State through various entities and legislation in control of energy and gas economy
- State has no policy on development of gas economy (yet?)
- State not aligned to industrial requirements for gas energy availability and cost efficiency
- Dispersed/limited volume scale to bank large gas infrastructure projects
- Emission standards driving industry towards natural gas and RE (limited space for moving)
- Out of time whilst the stakes are high – gas situation moving onto corporate risk registers globally & locally

How to establish a viable gas economy?

- Creating volume scale (demand aggregation) is critical - State to consider best manner to build scale with private sector to bank projects feasibly whilst maximizing socio-economic objectives
- SA economy requires State to be catalyst rather than controller of gas economy development
- Urgent establishment of State / private sector collaboration structures to address gas energy insecurity
“Establishing a viable gas energy sector in South Africa”

A dialogue to unlock the economic and human potential of South Africa

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Conclusion

Summary
Thanks and closure
Invitation to lunch
“Establishing a viable gas energy sector in South Africa”

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