BAKER & MCKENZIE

GLOBAL OIL & GAS INSTITUTE SERIES

The Rise of Gas to Power

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Agenda

- Global LNG Market Developments
- Why Gas to Power?
- Key Issues and Considerations
- Case studies – South Africa and Morocco
- Q&A

Global LNG Market Developments

Global LNG Market - Developments

- Historically LNG projects were very high capex developments based on fields in one location selling to an incumbent and monopoly utility.
  - Structures generally inflexible in terms of resource, risk allocation, quantities and delivery models.
  - Pricing based on seller's production costs
- Key developments – gas on gas competition in Europe
  - Gas prices set by fundamentals of supply and demand – producers required to market prices (development of market based pricing model).
  - Development of aggregators using multiple supply sources to provide for flexibility in supply terms, rather than linked to single field / liquefaction facilities.
  - Led to large differentials between Atlantic Basin prices and Asian prices (where linked to oil prices e.g. JCC) not justified by delivery costs alone.

Global LNG Market - Developments

- Key developments – US shale gas:
  - Fall in hydrocarbon prices and oversupply of gas in the market, plus greater competition
  - Ability to acquire US gas on Henry Hub linked pricing bases at a fraction of historical JCC prices
  - Japanese utilities buying mixture of JCC linked and Henry Hub linked prices – break the assumption of an immutable link between LNG and oil prices
  - Global oil price slump has also seen JCC linked pricing dropping below Henry Hub linked prices
  - In addition, US surplus provides potential for greater quantity flexibility – US gas and shipping can be acquired at levels of LNG actually required

Market Conditions

- Recent History: Projections
  - Since 2000 (Deutsche Bank):
    - Global natural gas demand: increased by 2.7% p.a.
    - Global LNG demand: increased by 7.6% p.a.
  - Future growth:
    - Global natural gas demand: to increase 1.6% p.a. to 2035 (twice the rate expected of oil) (IEA)
    - Global LNG demand: predicted to increase 5/6% p.a. to 2020, thereafter circa. 2/3% p.a. as markets mature
- BUT:
  - 2015 – reduction of demand in South East Asia has led to oversupply and falling prices (demand down 6.7% in Japan and China in 2015)
  - Sellers will still evaluate deals carefully (buyers / new markets are still competing for LNG supply, e.g. Brazil, Chile, Morocco and South Africa, and traditional buyers - EU, Japan, Korea, China)
  - Buyers' market at present, and buyers are seeking greater flexibility:
    - Fluctuations in ACQ have been accepted
    - Destination flexibility and price review provisions increasingly seen

World LNG Pricing (November 2013)

LNG Estimated Landed Prices

World LNG Pricing (May 2016)

LNG Estimated Landed Prices

World LNG Pricing Outlook

- Oil indexation will become more difficult
- Gradual migration away from oil-linked pricing – recent oil price slump has seen JCC linked pricing dropping below Henry Hub linked delivery prices (but this will not always by the case - oil price rises). Japanese utilities are currently diversifying their supply portfolios away from purely oil-linked contracts.
- Lowering of contract “slopes”
- Possibility of spot / hub gas-linked contracts for North American LNG, a “Henry Hub plus” pricing structure
- Buyer’s onsale / deferral rights are increasingly important – to take advantage when spot prices are high
- Development of Singapore SLNG – spot price index for Asian LNG
- Spot rates do not necessarily mean cheaper LNG prices
- Narrowing of regional differences – truly global, rather than regional pricing?

Why Gas to Power?

Use of Gas to Power Projects

- Gas to power projects used globally as a key element of diversified power networks:
  - In the US – plentiful indigenous gas and extensive pipeline network
  - In Europe – diversified supply – pipeline gas from Russia / North Africa plus indigenous reserves (e.g. Norway / UK) plus LNG (e.g. Spain)
  - In Japan / South Korea – no indigenous reserves, but LNG imports since the 1960s have been used to establish extensive gas network and infrastructure
- Relatively cheap up-front opex, and quicker to install and commission than coal-fired plant
- Current over-supply of gas in the market and low prices

Objectives of Gas to Power Projects

- Add significant capacity on an expedited basis
- Addition to long-term planned power generation mix
  – security of supply and fuel diversification considerations
- Grid stability – address inflexibility or intermittency of other generation sources (e.g. nuclear, renewables)
- Use of power to anchor development of gas markets
  – potential catalyst for development of domestic gas reserves, or industrialisation
- Address environmental concerns
- Potential for fuel switching from existing diesel / fuel oil-fired plants

Key Issues and Considerations

Key Issues & Considerations

Project / Infrastructure Issues

1 – **Existence of a gas market**

- Does the proposed jurisdiction have an established gas market?
- Reconciling LNG sales with power consumption
- Is there an alternative source of gas available or alternative customers for excess gas?
- Does the gas supply or power offtake address imbalances?
- Potential to trigger development of a domestic gas market – e.g. South Africa
- Regulatory issues, particularly as to retail gas pricing/ third party access

2 – **Availability of infrastructure**

- Reception / pipeline facilities available?
- Infrastructure effect on project economics and risk
- Types of infrastructure – land based or floating terminals?

3 – '**Project on Project' Risk**

- Inter-connectivity risks associated with broad range of project components and participants
- Are projects fully integrated or are separate projects interconnected?
- Steps that can be taken to mitigate particular project on project risks

Key Issues & Considerations

Financing / Economic Issues

4 – **Long term economics and fuel price risks**

- Fuel price fluctuations can be steep and unpredictable
- LNG gas to power projects require very high capex and are inherently of a long term nature
- Pricing economics need to be reflected in the PPA, with appropriate levels of indexation to address fuel price rises
- Consider need for government guarantees to back offtaker payment obligations

5 – **Bankability and project financing**

- How are risks to be addressed in the project documentation?
- Availability of support from ECAs?

6 – **Dollarisation / FX concerns**

- Very large proportion of LNG gas to power costs (both capex and opex) will be payable in US Dollars (e.g. turbine acquisition and maintenance, fuel costs)
- What currency will the power be sold in? If local currency, what is the historic relationship between this currency and the US Dollar?
- Investors unlikely to take currency risk – will need to be passed through in the PPA.
- Currency denomination of project financing? Is there sufficient capacity within the local lending market to support a project of this nature?

Key Issues & Considerations

Local and Regulatory Issues

6 – **Creditworthiness of PPA purchaser**

- Entire project hinges on PPA, and ability of offtaker to meet each of its payment obligations
- Who will be the offtaker? Is it a state-owned utility?
- Long term nature of project economics will require a long term (likely 20 year +) PPA
- Availability of government guarantees or other sureties may be central to bankability of project

7 – **Environmental considerations**

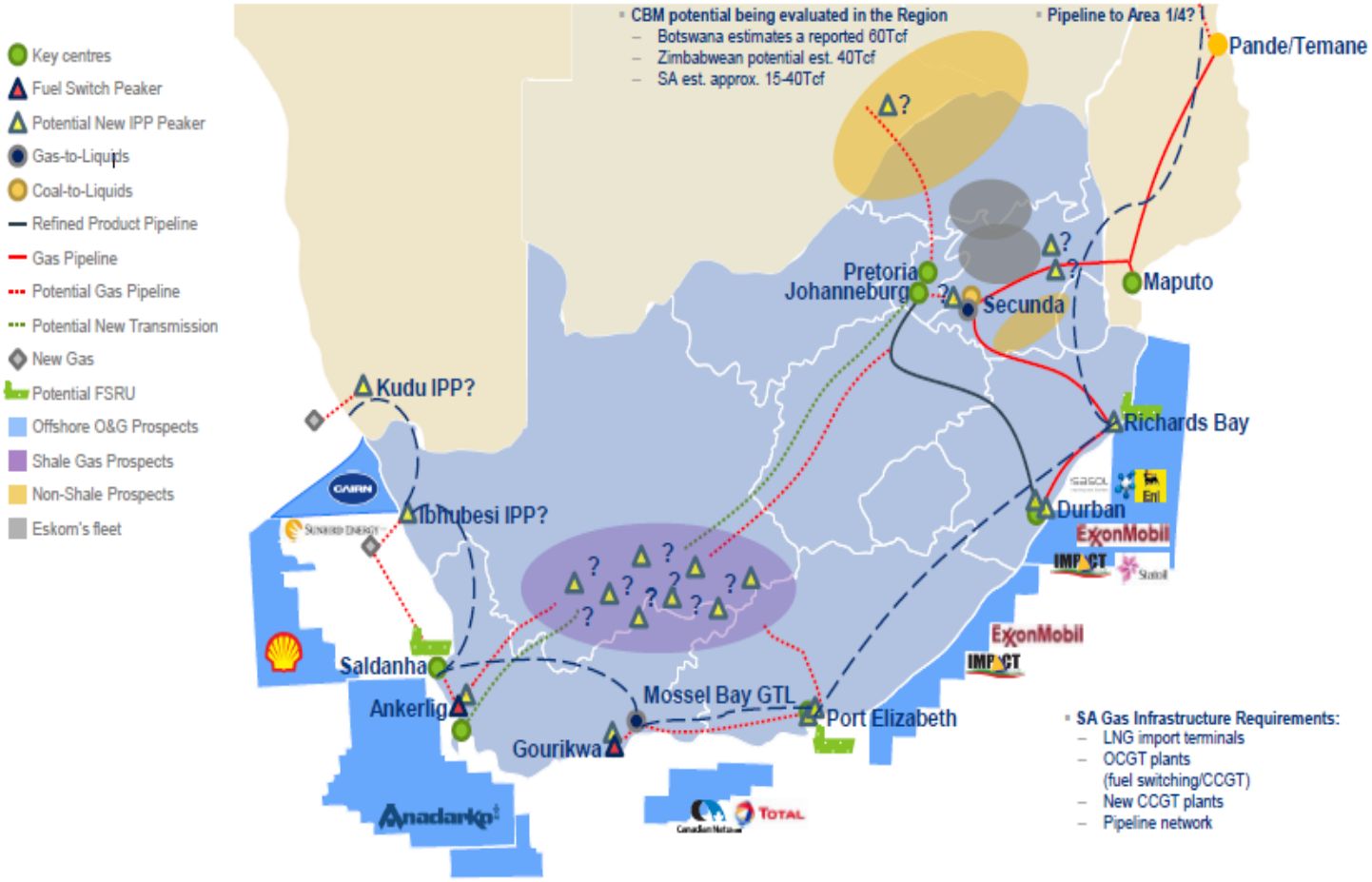
- More of a 'clean' fuel than coal or fuel oil – a key driver in South Africa, where the government is looking to reduce reliance on coal generated power
- But a broad variety of issues to be considered, including offshore and coastal effects of FSRU or FSU usage

8 – **Local content requirements**

- Nature of CCGT technology does not lend itself well to local content requirements
- Particularly the case in a country which is new to gas to power technology, without established ancillary or service sector
- Other considerations, such as BEE in South Africa need to be assessed by foreign investors and can effect project economics
- But, can be used as a catalyst for development of local skills and industry within the country

Case Studies – South Africa and Morocco

South Africa – gas infrastructure



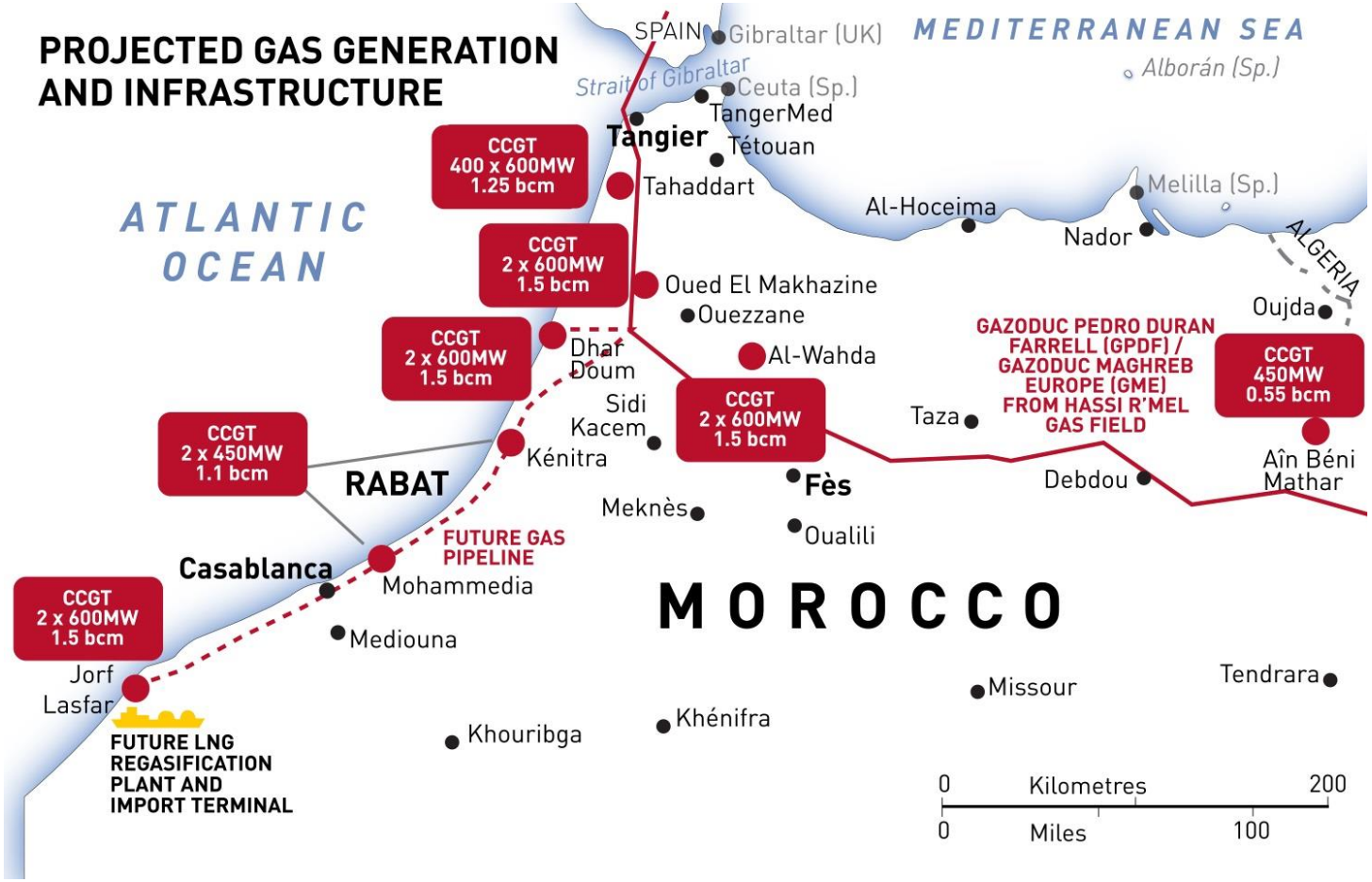
South Africa

- LNG to power projects at three port locations (total of 3126 MW)
- The Department of Energy ("DOE") confirmed plans to procure a new 600 MW gas-fired power generation project, to be developed as a public-private partnership. It is envisaged that the private 'strategic partner' will work with the State-owned companies (SoCs) to implement the project, with private sector partners playing the lead role in developing, financing, operating and maintaining the facility
- Use of FSRUs (one vessel at each of three port locations)
- Bundled project structure, but with proposed multiple IPPs at each location
- Development of indigeneous gas reserves and a domestic gas market
- Key concerns – FX risks, lack of alternative gas supply, political risk?

Future Developments – Unlocking SA's Domestic Gas Resources

- Indication that LNG projects will be used to develop a gas market in South Africa
- Intention is to use this as a trigger for the development of domestic gas resources. All three proposed sites are close to current offshore and shale exploration blocks
- LNG import (and associated costs) would be phased out if a reliable, economic, indigenous gas source could be used.
- How does this fit with proposed bundled structure? IPPs may not incentivised if project could directly benefit competitors. What protections/comfort can IPPs seek from Eskom/government?

Morocco – gas infrastructure



Morocco

- High economic growth (6% p.a.) is driving up power demand. Additional capacity required to meet these needs
- Low levels of existing gas production, potential shale gas development
- Some existing gas infrastructure (e.g. pipeline from Algeria to Spain)
- Objectives:
  - fuel source diversification
  - environmental concerns
  - gas market development & industrialisation
  - address power shortfall –grid stability – intermittances caused by renewables projects to be addressed

Morocco

- Project:
  - Land-based LNG import terminal at Jorf Lasfar (4 mtpa)
  - 400km gas pipeline
  - 2 x 1200MW CCGT power plants (IPPs) at Jorf Lasfar and Dhar Doum – coming on line in stages between 2021 and 2025.
  - Conversion of two existing 450 MW oil fired plants to CCGT
  - 1.5 bcm of gas to be used directly by industry (3.5 bcm for gas to power)
- Unbundled: 2 elements:
  - terminal, pipeline & IPPs as a single project
  - LNG import
- Project cost: estimated $4.6bn.

Asia Pacific gas to power story

- 3 broad trends
  - Increasing gas to power generation capacity (but cf coal)
    - More competition for traditional LNG buyers
      - Indonesia slated to be a net gas importer by 2020
  - Changing price dynamics
    - But, impact of transportation costs
    - Traditional buyers still want to maintain LNG supply mix, to mitigate different risk profiles
  - Interconnectedness
    - Increasing moves to supply power cross-border
    - Geographical restrictions – LNG break bulk models

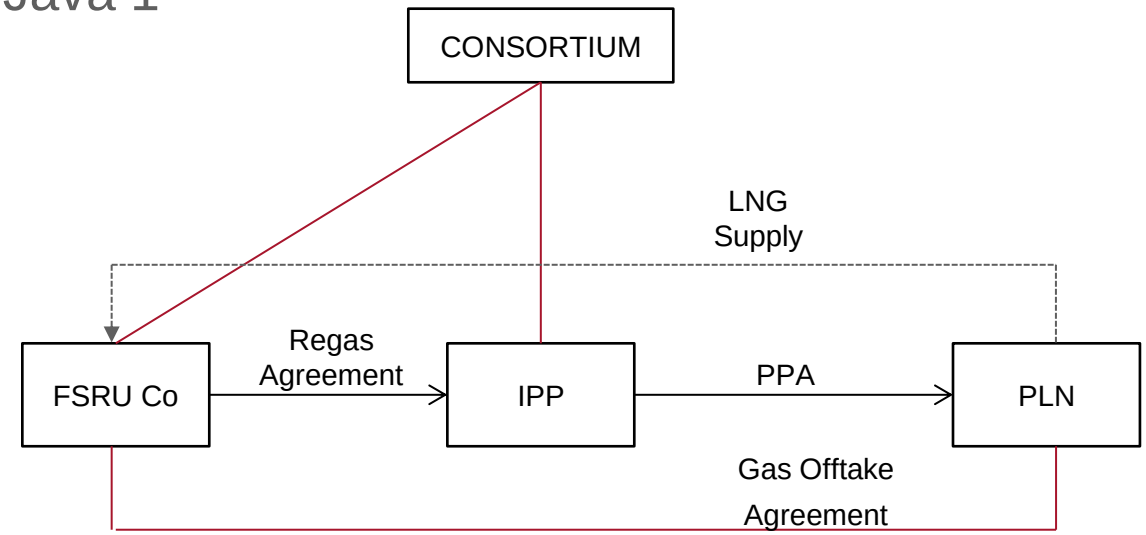
Electricity generation - S.E. Asia TWh

					Shares		CAAGR*
	1990	2013	2020	2040	2013	2040	2013-2040
Fossil fuels	120	648	925	1 699	82%	77%	3.6%
Coal	28	255	482	1 097	32%	50%	5.6%
Gas	26	349	406	578	44%	26%	1.9%
Oil	66	45	36	24	6%	1%	-2.2%
Nuclear	-	-	-	32	-	1%	n.a.
Renewables	34	141	180	481	18%	22%	4.7%
Hydro	27	110	119	255	14%	12%	3.2%
Geothermal	7	19	27	58	2%	3%	4.2%
Bioenergy	1	10	22	75	1%	3%	7.7%
Other**	-	2	12	93	0%	4%	16.0%
Total	**154**	**789**	**1 104**	**2 212**	**100%**	**100%**	**3.9%**

*Compound average annual growth rate. **Includes wind and solar PV.

Case study - Indonesia

- Mix of different gas to power project strutures, e.g.:
  - PLN (state owned power co.) = genco
  - IPPs (IPP procures gas/PLN supplies)
  - e.g. Java 1



NB:

- 2 x 800MW nett capacity gas Fired IPP project, West Java Province, Indonesia
- Gas receiving facilities, 500 kV transmission line to PLN's Substation at Maura Tawar
- 25 year term, BOOT
- Only one FSRU, multiple uses of FSRU offtake gas, not just the IPP's power station
- Issues: risk allocation / pass thru.; financial viability; land; supply FM and sourcing gas; FX; cabotage; procurement rules

Q&A