Global FLNG 2017 Conference



Gas to Power – Commercially Feasible Solutions for New Markets How to access new market demand in a more affordable manner?

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SyEnergy Overview



- Energy consultancy on strategy, business/project development, technical, commercial & legal issues.
- Team located in UK, USA, and Brazil with 25-40+ years of experience in business development, project management, technical / engineering, contract / dispute negotiating, and senior management advice.
- Advised and developed energy projects located in West, East & North Africa, Middle East, Europe,
 South & North America, Indian Sub-continent, Caribbean, Caspian, Indonesia and Australia.
- Direct experience with LNG liquefaction operations in Nigeria, Qatar, Angola, Indonesia and Australia.
- LNG business development in Angola, Nigeria, Trinidad, Russia, Venezuela, Iran and Congo (FLNG).
- FSRU business development, advice, and negotiations in Argentina, Brazil, Pakistan, and USA.
- Power projects in Brazil, Nigeria, Egypt, Saudi Arabia, USA, Turkey and West Africa and SE Asia.
- Support, negotiation and conclusion of 50+ MoUs and 20+ GSA and LNG SPAs.
- Successful advice, negotiation and resolution of commercial disputes valued over \$25 Billion.
- Senior decision and advisory support services: Government Authorities, complex project development, business process improvement, agreement negotiation, shareholder committees, board decisions.
- Business process improvement for industrial, utilities, and financial service companies.
- Project portfolio assessment and management (resource and capital allocation) aligned with strategy.
- Business modelling / simulations supporting alliances, joint-venture and M&A transactions.
- Bespoke energy training courses for in-company staff and/or external stakeholders.

Principal Area of Activities





LNG Supply



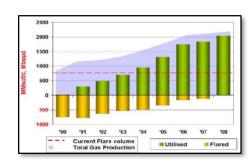
FSRU Development



Power Generation



FLNG Development



Gas Monetisation & Master Plan



On-shore Regas



Project Mgmt + A&D Support



Gas Pipelines



Senior Advisory

Professional and Client Experience





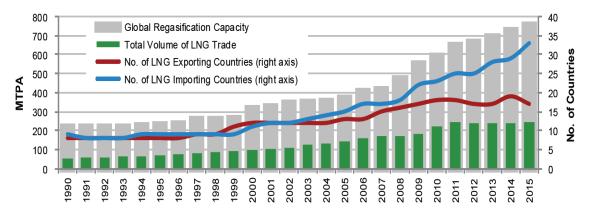
Insper Instituto de Ensino e Pesquisa

BankBoston

Global LNG Post 2020 – Where are the buyers?



LNG MTPA	2000*	2016*	2030**
Liquefaction Capacity	125	340	<i>670</i>
Regas Capacity	250	830	1,740
LNG Trade	100	264	<i>500</i>
Liquefaction Capacity Utilisation	80%	78%	<i>75%</i>
Regas to Liquefaction Ratio	2.00	2.44	2.60



LNG Buyers and New Market Segment

China, India, Middle East, Southeast Asia, Latin America

Europe : declining production + FSRU + diversification of supply

Africa: FSRU + lower prices + 50% of pop growth over next 20 years

LNG as fuel: bunkers in developed economies rolling out globally

Changing LNG Supply

Decline: Algeria, Malaysia, Indonesia

Prime: Australia, Qatar, West Africa

Rising: North America, East Africa

Watch: East Mediterranean, Russia

Focus: Lower LNG cost \$/ton

LNG Demand Drivers

FSRU growth

Coal death spiral

Nuclear retirement

Substitution of liquid fuels

Power generation

Renewables intermittence

Air quality

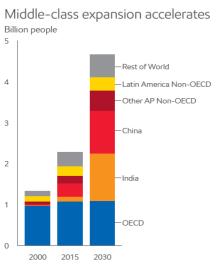
Declining indigenous production

Diversification of supply

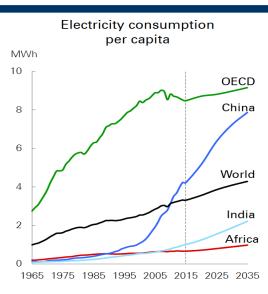
LNG as fuel

Global Gas Power Generation - Robust Future

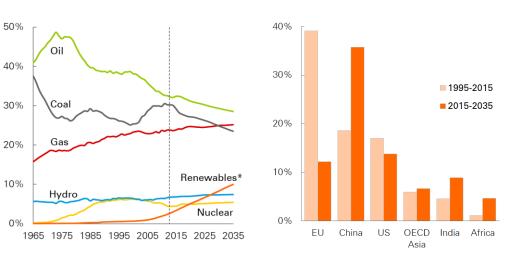




Shares of primary energy

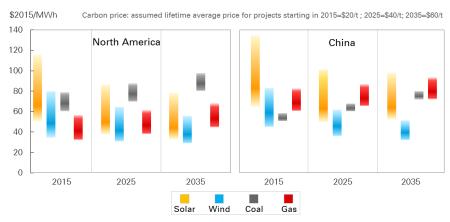


Shares of renewable power growth



Potential air conditioning requirement for 30 major metropolitan areas Bangalore Belo Horizonte Rio de Janeiro Cooling degree days multiplied by metropolitan population (M) 60,000 30,000 15.000 5.000

Cost of power generation from new-build plants*

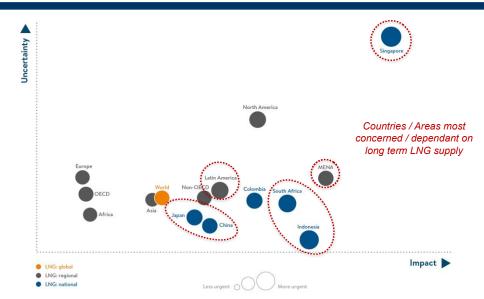


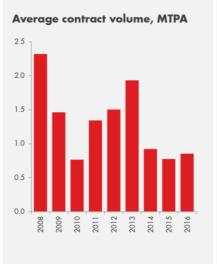
^{*}Levelized cost of power over the lifetime of a plant. Ranges reflect the impact of low/high estimates for: cost of capital; load factors for solar and wind; fuel prices for gas and coal. Solar and wind include estimates of system integration costs

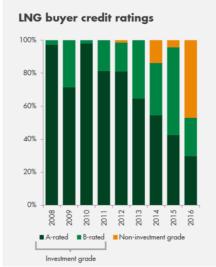
Source: The Brookings Institution, BP Energy Outlook 2017, Sivak, ExxonMobil Outllook for Energy 2017

Global Concerns: Long Term Supply & Energy Cost

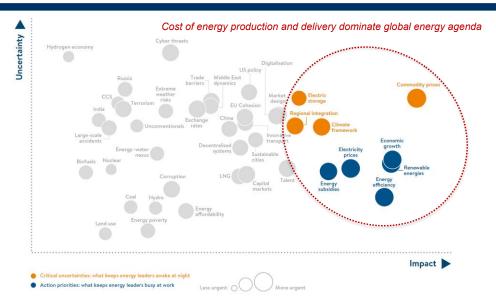








Source: World Energy Council, Shell



New Gas/LNG to Power Project Challenges:

Lower oil and gas prices

Smaller contract volumes

Shorter contract duration

Buyers with lower credit ratings

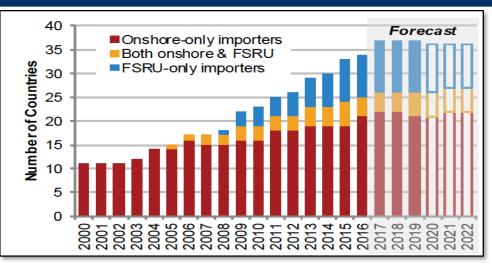
Ability to secure project financing

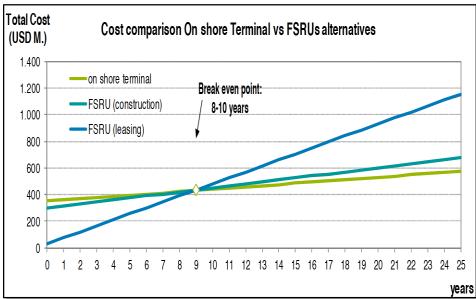
Innovative optimised volume / capex / opex energy solutions required to unlock markets & secure financing

Gas / LNG to Power Energy Solutions









Source: IGU, Hoegh/Golar, Enagas

implementation, economic advantage over a 10-15 year horizon. Tolling fee business model without

LNG FSRUs are optimal solutions offering timely

equity investment from client.

On-shore / FSRU LNG: ~6 Mtpa or 6,000 MW

On-shore LNG terminals can cost >\$1.0 Billion and require 5 years for construction. They are economically attractive with significant utilisation, and the need for Gas/LNG storage and/or LNG reloading services.

Gas / LNG to Power Energy Solutions









Source: Wartsila, 7seas, Hoegh

Barge LNG Regas / Power : ~0.2-0.4 Mtpa or 200-400 MW

Growing range of potential solutions combining FSRU + Power, and LNG Regas Barges + Power Barges with jetty-less solutions reducing cost of marine facilities

Significant reduction of LNG and Power capex enabling lower volume markets to be supplied. LNG delivery logistics need attention. Unclear if tolling model available

Gas / LNG to Power Energy Solutions









Source: Hantong Ship Heavy Industries, SeaNG, Karpowership / Karadeniz Holding Co

Power Barges: ~13-106 mmscf/d or 100-800 MW with Marine CNG offering scalable gas supply over a ~2,000 km range

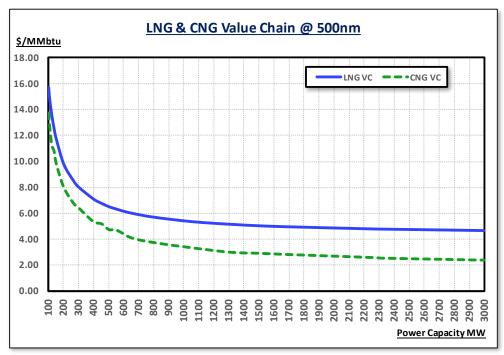
Energy Density - LNG 600 : 1 - CNG 300 : 1

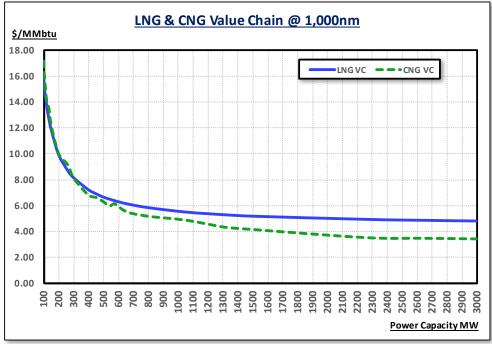
Compression is less capex intensive than liquefaction

Marine CNG and Power Barge further reduce capex enhancing the economic feasibility of a wider range of gas to power solutions. Marine CNG can also provide a tolling fee business model without equity investment from client.

Indicative Value Chain Comparison @ 500 - 1,000nm







Notes: 15 year contract, 10% cost of capital, and include weathervaning mooring solution. Power generation capex and gas cost excluded. LNG Liquefaction \$4.00/mmbtu. LNG Shipping 170,000 m3 (75K/day, \$300K Port Fees, 19knots). FSRU / Mooring 170,000 m3 / 6 Mtpa (175K/day Capex/Opex).

Marine CNG is particularly advantageous at shorter distances. When supplying 500 MW of power generation capacity, savings of ~\$50 million/year are possible.

Where Can SyEnergy Add Value?



- Competitive Intelligence, Strategy Formulation, and Business / Project Development
- Regional Gas Master Plan, Gas Supply Plan, and Gas Monetisation Alternatives
- Conceptual and Feasibility Studies
- Gas / LNG Procurement and Portfolio Development Strategy
- Gas / LNG Pricing, Netback and Quantitative Analysis
- Support and/or Lead Key Commercial Contract Negotiations (FSRU, Gas / LNG Supply)
- Pre-FID Project Support and Value Assurance Review
- Structured Transaction Support and Due Diligence
- Project Team and Senior Management Advice
- Dispute Resolution, Arbitration, and Price / Contract Renegotiation
- Bespoke Energy Training