Council Workshop
Yogyakarta, 10 October 2029
Programme (10:30-13:00)

❖ Welcome address

❖ Panel discussion 1
  “Current Status and updates on the Natural Gas Industry”

❖ Panel discussion 2
  “The Role of Gas in Fueling Sustainable Growth in Asia”
Role of Gas in Ensuring Energy Sustainability in South East Asia
10 October 2019
James Ooi
Introduction to TLG
We are Asia Pacific’s premier energy-focused strategy and economic consulting group

Consultants to the Energy Sector
- Competition, Markets, Regulation, Policy
- Decisions Support Analysis
- Market Analysis
- Strategy and Advanced Analytics

Offerings:
- Strategic, commercial, and regulatory support
- Ability to connect the dots between fuel markets and power
- Analysis-based recommendations
- Highly relevant international experience
- Accessible experts focused on the region
- Pricing, trends, drivers, risks

Languages:
- Arabic*
- Cantonese
- Mandarin
- English
- Bahasa Indonesia
- Bahasa Malaysia
- Bengali
- French
- German
- Hindi
- Japanese
- Korean
- Swedish
- Tagalog*
- Thai*
- Vietnamese*

Office/Presence
- Senior Advisors

Affiliates:
- London
- Singapore • Hong Kong • Bangkok • Seoul • Perth
Introduction to TLG
Recent projects undertaken by TLG on LNG in the South Asia / South East Asia Region

Active in the region since 1990’s, our Natural Gas and LNG Market practice has worked on hundreds of engagements, helping both companies and governments unlock hidden potentials, and even reshaping the gas and LNG sector itself.

Key Offerings:
- Regulatory
- Strategy
- Commercial arrangements
- SPA and contract negotiation
- Market Analysis
- Assets valuation
- Entry / Exit advisory
- Gas advocacy
ASCOPE LNG Advocacy White Paper

The Gas Advocacy Taskforce (GATF) of the ASEAN Council on Petroleum (ASCOPE) is mandated to promote sustainable utilization of gas resources and infrastructure in ASEAN, with the ultimate goal to develop a common gas market in ASEAN for the benefit of ASEAN and ASCOPE members.

- Gas market development to sustain much required infrastructure
- Support capital market and financing to the sector
- Actions by stakeholders
- Talent, capability development, and innovation
Role of Gas in ASEAN Energy Future

Three emerging strategic focus areas of conflict and opportunity

**COAL?**

**LONG TERM PPAs?**

**EASY WINS?**

**Race to the Bottom?**

**Intricate Commercial Dilemmas**

**Advocacy**

**PREMIUM PAID FOR EXISTING RE ASSETS / PORTFOLIOS**

- Aboitiz buys into GN Power
- SMC buys AES Masinloc
- GIP buys Equis for 5 billion dollars
- KEPCO buys into Solar Philippines
- Macquarie offers to buy EDL

**LNG value chain development in the Philippines and Vietnam**

LNG will be a complex multi-party value proposition, requiring clear allocation of risks and a robust evaluation framework.

**HIGHLIGHTS**

- Entry is getting more difficult
- Cost of alternatives is higher
- Established positions hard to replicate

**ISSUES**

- Falling costs / dynamic supply chain
- A lot of capital chasing (still) few projects
- Must be agile – strong execution focus
- Value linked to future growth/optionality

**DIFFERENT OPPORTUNITY DRIVERS ARE CHANGING PROJECT DEVELOPMENT APPROACH**
Resulting in increasing debate in ASEAN energy policy convergence towards security and sustainability

- Emphasis placed on securing supplies of fuel, diversifying sources, stocking requirements

- Emphasis placed on environmental sustainability / impact

- Emphasis placed on low cost fuel supply, sensitivity of political process to populist concerns over cost, etc

ASEAN member countries need to harmonize the demanding objectives of a reliable, high-quality supply against requirements for cost-effectiveness and environmental sustainability at the individual and collective level to bring about maximum benefits

Policy shifts from 2015
1. Brunei
2. Cambodia
3. Indonesia
4. Laos
5. Malaysia
6. Myanmar
7. Philippines
8. Singapore
9. Thailand
10. Vietnam

Source: TLG
ASEAN is home to the world’s highest electricity growth region, and the fourth largest economy by 2030

- ASEAN’s electricity demand is forecasted to almost double from ~1,000 TWh in 2018/19 to ~2,000 TWh in 2030, lead by Vietnam and Indonesia.

- Peak demand in ASEAN will reach 305 GW by 2035. This implies an average new power capacity requirement of 13 GW per annum from 2020-2030.

Source: TLG
But, energy security landscape across emerging markets in Asia is changing
Indigenous gas production and resource declining...

Bangladesh: Solving domestic gas supply constraints, low tariffs and high
dependency on liquid fuels. Technology diversification towards energy security

Pakistan: Critical domestic gas supply constraints: high growth market with urgent need to solve domestic gas and power shortages

Thailand: Depleting domestic gas production; Fuel diversification policy favoring gas/LNG: pricing and subsidy; focus on renewable & coal policies

Malaysia: Depleting domestic gas production; fuel diversification need; price formation & subsidy issues


South Korea: Role of gas to expand with the need for flexible capacity and policy-driven reduced reliance on coal and nuclear. Major KOGAS gas contracts to expire in 2020s; new pricing formation to enter to impact both gas and power markets

Vietnam: High demand growth; existing gas depleting, new fields in development vs. LNG; pricing and subsidy issues. Uncertain opportunities for infrastructure projects

Philippines: Gas Constrained; urgency to create LNG value chain to defend gas position, and a balanced technology mix for the power sector

Indonesia: domestic gas optimisation (domestic fuel obligations vs. export commitments, etc). Portfolio issues: significant gas/LNG tradeoffs and options

Source: TLG
As a consequence of the “Destructive” energy cycle without policy mitigation, dependence on coal will have to increase.
ASEAN is also seeing strong penetration of RE due to costs

- Solar costs in the Philippines are lower than the range of forecasts globally based on recent CSP solar deals.
- Costs are expected to decline further over the long-term, and we expect solar costs to trend towards PhP 2.3-2.5/kWh by 2030-2035, which is in line with the lower range of other forecasts.

- Battery costs, similar to solar, are also expected to decline from current levels of ~US$250/kWh to level out at ~US$90/kWh by the early 2030s.

Source: BNEF; NREL; TLG analysis
In the Philippines, shift to RE is strengthening, and reaching coal parity

Source: TLG analysis
In Vietnam, previous FIT scheme alone had driven 5GW of solar entries (March – June 2019)

LCOE Screening Curves for New Power Generation in Vietnam

Gas-fired power plants become more cost competitive versus coal-fired projects when operating at lower capacity factors.

Note: Coal and CCGT capex of USD 1,200 and 1000/kW respectively; Coal and CCGT heat rate of 9.00 and 6.8 GJ/MWh respectively; Coal and CCGT auxiliary consumption of 8% and 3% respectively; Coal and CCGT FOM of USD 50 and 23/kW/year; Coal and CCGT VOM of USD 3.00 and 0.66/MWh respectively; Coal and CCGT lifetime assumed to be 25 and 20 years respectively; Brent oil price of USD 60/bbl; Solar is based on draft FIT range; Wind is based on current FIT.

Source: TLG analysis, government decisions and circulars (including draft)
Generation capacity additions projected in official plans had opted for diversification strategy towards defending the share of gas (unwilling to increase reliance on coal) and increasing RE penetration (to leverage technology benefits).

### Installed Capacity: Existing vs. 2025

<table>
<thead>
<tr>
<th>Country</th>
<th>Existing Capacity (2018)</th>
<th>Total Capacity Addition (Existing-2025)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>205</td>
<td>124</td>
</tr>
<tr>
<td>Vietnam</td>
<td>205</td>
<td>81</td>
</tr>
<tr>
<td>Thailand</td>
<td>205</td>
<td>69</td>
</tr>
<tr>
<td>Malaysia</td>
<td>205</td>
<td>134</td>
</tr>
<tr>
<td>Philippines</td>
<td>205</td>
<td>115</td>
</tr>
<tr>
<td>Singapore</td>
<td>205</td>
<td>100</td>
</tr>
<tr>
<td>Myanmar</td>
<td>205</td>
<td>24</td>
</tr>
<tr>
<td>Laos</td>
<td>205</td>
<td>5</td>
</tr>
<tr>
<td>Cambodia</td>
<td>205</td>
<td>15</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>205</td>
<td>1</td>
</tr>
<tr>
<td>Pakistan</td>
<td>205</td>
<td>4</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>205</td>
<td>5</td>
</tr>
</tbody>
</table>

### ASEAN Power Capacity Outlook

- **Other RE/Import**
- **Wind**
- **Solar**
- **Oil**
- **Natural Gas**
- **Coal**
- **Nuclear**
- **Hydro**

**Note:** Brunei is not included as its power development plan is not public.

Gas and RE partnership. Gas increases system flexibility and is complementary to intermittent Solar generation.

Reference Case in Luzon (2040)

Gas could be squeezed if only a moderate amount of solar is built.

Aggressive Solar Entry Case in Luzon (2040)

If solar capacity is increased to create a duck curve, gas becomes more economical as the flexible fuel. High solar penetration also presents long-term risk for coal as no base-load power is required.

Source: TLG
Gas-fired capacity is also the most economic in the mid-merit as long as gas is available flexibly.

**Basic characteristics of coal vs gas**
- Coal – high CAPEX, low fuel price
- CCGT – low CAPEX, high fuel price

Coal capacity value is vulnerable at lower utilisation due to higher capital costs relative to gas.

Gas capacity value is robust at lower utilisation unless committed to take too much gas.

The amount of gas that is optimal swings wildly with changes in fuel costs.

**Note:** Key assumption: LNG regas and associated pipeline tariff to the power plants is US$1.5/mmbtu and coal transportation cost is US$7/metric tonnes; capital cost coal US$1,800/kW; LNG-fired (2014 JP DES LNG @ 16/mmbtu); LNG-fired (2016 JP DES LNG @ 7.0/mmbtu); HHV net heat-rate coal 9.5 GJ/MWh, gas CCGT 7.2 GJ/MWh, FOM is USD 40/kW-year for coal and USD 23/kW-year for gas, VOM of coal is 2.5/MWh for coal and USD 1.0/MWh for gas. WACC is 12 percent.
ASEAN currently has seven operational LNG importation facilities, comprising of two FSRUs (both in Indonesia), one small-scale FSU and FRU (in Bali, Indonesia), and four onshore regasification terminals across Indonesia, Singapore, Malaysia and Thailand.

* Offshore proposal/facility.
Progress in TPA in the SEA region is also creating more liquidity for LNG trading

**Thailand**
- The TPA that currently applies to the LNG terminal and onshore pipelines is based on negotiated access.
- As part of NEPC’s resolution to assess market liberalization with TPA, EGAT has been given the green light to import 1.5 mmtpa via LNG terminal at Map Ta Phut in Rayong Province.
- Tariff for the PTT terminal and gas transmission line will be changed from using life cycle to five-year periods of allowed revenues based on a regulated asset base. This will enable resets every five years to reflect changing interest rates in the WACC calculation.

**Malaysia**
- The TPA codes for LNG terminals, gas transmission and gas distribution were finalised, approved, and came into force on 16 January 2017. The implementation of TPA will be under the oversight of the Energy Commission.
- The Gas Supply Act Amendment 2016 puts the responsibility for approval of tariffs under TPA with the Energy Commission.

**Singapore**
- Open Access terminal. Its third tank is leased to third party on short term basis with offloading reloading capability.
- In the current regulatory period (FY 2014-2018), for domestic use, reservation charge is set at S$1/mmBtu and utilization charge (S$ 0.45-0.65/mmBtu) is set according to peak, shoulder and off-peak periods. Utilization charge is revised every six months to reflect changes in OPEX cost.

**Indonesia**
- Owners control access to FSRUs and onshore terminals, with no indication of any TPA.
- Tariff regulation is by various Ministries and subject to business-to-business negotiation.
- MEMR regulation 58/2017 sets a maximum IRR on gas infrastructure of 11% in local currency terms, which may place hurdles to the build out of future terminals and LNG delivery systems.
Gas and its associated infrastructure can offer considerable benefits to ASEAN member countries by addressing all elements of the energy trilemma.

**Cost effective**
- Economical for mid-merit and peaking option
- Economically robust to meet the mid-merit load.
- It is economical to replace diesel in both power and non-power sector if infrastructure and associated logistics can be worked out.

**Increase in Energy Security**
- Valuable hedge against coal delay
- Increase security of gas supply
- Increase strategic and dispatch Flexibility
- Provide an effective medium for energy transmission

**More Environmentally Sustainable**
- Less carbon and non-carbon emission
- Compatible values with increasing RE penetration

Note: there are other values of gas, such as lower regret cost in the energy transition as gas is less capital intensive than coal.
The end goal is a balanced, sustainable fuel mix that delivers total system least costs

Installed Capacity by Fuel (ASEAN)

- Coal: +5.4%
- Gas: +4.3%
- Hydro: +3.5%
- Renewables: +12.7%
- Oil: -1.9%

18-30 CAGR

Installed Capacity by Fuel (ASEAN)

- Others
- Renewables (Solar/Wind/Geothermal)
- Hydro
- Nuclear
- Gas
- Oil
- Coal
ASEAN’s gas future depends on the adoption of LNG imports

**Natural gas demand in ASEAN**

- **18-30 CAGR**
- Other ASEAN
- Myanmar
- Malaysia
- Indonesia
- Vietnam
- Thailand
- Philippines
- Singapore

**LNG import demand in ASEAN**

- **18-30 CAGR**
- Other ASEAN
- Myanmar
- Malaysia
- Indonesia
- Vietnam
- Thailand
- Philippines
- Singapore

Note: 2010-2017 Actual, 2018 Preliminary, forecast thereafter
Source: GIIGNL, Country Statistics, TLG Analysis

- **Growing ssLNG and LNG bunkering activities**
- **Continued growth in gas-fired capacity**
- **Robust energy policy support and investments to sustain economic growth as reflected in Power Development Plans and Gas Master Plans in ASEAN**

**TLG base case**:
- Total gas consumption in ASEAN will be 15,800 mmcfd by 2025 (20% LNG), 20,000 mmcfd by 2030 (29% LNG).
- Gas power generation share is projected to achieve 27% in 2025 (about 9,000 mmscfd), and 24% in 2030 (about 10,000 mmscfd).
Role of Gas in Ensuring Energy Sustainability for ASEAN

Strong economic growth potential → investments in the power and fuel sectors

- Average annual electricity demand growth: 5.7%, from ~380 TWh in 2000 to 970+ TWh in 2017
- Likely average sustainable rate from 2020 to 2030: 5.6%. An average annual power capacity addition of 13 GW from 2020-2030, increasing to 15 GW for the next decade

Require robust energy policy support and investments to sustain the strong economic growth

- Strong appetite to achieve a balanced, reliable, secure and cost-effective energy supplies
- This is reflected in Power Development Plans and Gas Master Plans in all ASEAN nations, which promote increased diversification in its fuel and technology mix.

Coal remains dominant for its low cost but faces high project slippage risks and environmental and health impacts

- TLG projects coal usage in the power sector as reaching 50% in 2030. However, overly depending on coal also increase the risks of unmet demand arising from project slippage rates due to siting constraints and stricter environmental regulations.

Gas will continue to play an increasingly important role in ASEAN’s energy future

- Gas is the most economic option for mid-merit and peaking application
- Gas is complimentary to intermittent renewable generation resource for reliability.
- Extending the economic life of existing gas-fired power plants provides cost-competitive generation supply

Gas will continue to play an increasingly important role in ASEAN’s energy future
Sustainable energy (gas) policy will be important

Legal and Regulatory Framework

Power Sector
- Power sector must evolve into functioning wholesale market in alignment with gas market

Gas Sector
- Encourage private sector participation/ownership of some critical energy infrastructure including LNG terminals
- Wholesale gas market be developed.
- Phased plan for third party access, functional separation and unbundling

Persistent economic growth results in rising power demand, and gas requirements

Encourage upstream investments

Yes
- Functional gas market / sector

No
- Upstream investments not keeping up

Geological, Geopolitics
- Investment outflow
- Fall in domestic production
- Depletion

Select robust business model for LNG value chain

Increase foreign participation and investments

Enable LNG to deliver total system least cost by contracting flexibly

Sustainable gas price formation mechanisms and tariffs

Reduce dependency on coal

Complement RE

Source: TLG
ASEAN Gas Market Development Pathway

LNG is an effective bridging fuel to encourage and support domestic indigenous gas resource development

- LNG projects have shorter development cycles and lower regret costs and can address immediate gas resource depletions, promote market-based price formation, and signals to support sustainable economic developments in both upstream and downstream.

However, gas pricing reform progress is slow

- Not all ASEAN markets can support market-based pricing for gas (LNG).
- Gas market (pricing) reforms will be needed to promote a wider range of gas import sources, as well as development of newer fields with higher wellhead costs. It can promote a more economically efficient use of gas (i.e. moving from base-load to mid-merit).

Many challenges in developing gas infrastructure projects

- Gas sector infrastructure (pipelines, and new supplies) and power capacity and transmission augmentation programs are complex.
- Difficult commercial and regulatory challenges, especially on gas contracting and access arrangements needs.
Anatomy of Gas-to-Power Development

Development Landscape

- Role of Gas and LNG
- Fuel and technology Competition
- Market Structure, Policy & Regulatory Framework
- Business Model
- Commercial Framework

Characteristics

- Security, Diversity, RE Partnership
- Baseload or Mid-merit or Peaking
- Price or quantity based driven, PPA or merchant, Centralized or Decentralized. Fuel Cost Passed Through, Tariff Formation, TPA and Access Arrangements
- Tolling/integrated/hybrid value chain structure, Role of SOE – Public, Private or Public Private Partnership
- Fuel cost passed through, Sovereign Guarantee, Financing
The Lantau Group (TLG) is appointed by the World Bank to provide technical assistance for the facilitation of LNG-to-power developments in Vietnam ('the Project').

Phase one of the project entailed reviewing and recommending a legal and regulatory framework for LNG-to-Power developments in Vietnam, whilst Phase two involved designing an LNG procurement and risk mitigation strategy that fits with the Vietnamese context and requirements.

A workshop was held in Hanoi on 26th of June 2018 to present the findings of the project to the key gas stakeholders in Vietnam comprising of the Ministry of Industry and Trade (MOIT), state-owned enterprises (SOE) such as PetroVietnam (PVN), PetroVietNam Gas (PVGas), Vietnam Electricity Corporation (EVN) as well as private sector participants.
Thank you

For more information please contact us:

**By email**  
James OOI – Partner  
jooi@lantaugroup.com

**By phone**  
+65 6957 1458 (Singapore office)

**By mail**  
The Lantau Group (Singapore) Pte Ltd  
24 Raffles Place, #25-01  
Clifford Centre  
Singapore 048621

**Online**  
www.lantaugroup.com
Regional Trends in Financing Energy Projects in South East Asia
International Gas Union
Yogyakarta, Indonesia

10 October 2019
DBS Bank

Financial Powerhouse, Born & Bred in Asia

Best Bank in the World –
Global Finance (2018)
The Banker (2018)
Euromoney (2019)
World’s first bank to hold
three global best bank
honors at the same time.

World’s Best Digital Bank –
Euromoney (2018, 2016)
Recognition for DBS’ digital
leadership not just in Asia
but the world.

Safest Bank in Asia –
Global Finance (2009 - 2018)
DBS’ credit ratings of AA-
and Aa1 by S&P and Moody’s
are among the highest in the
world.

Strong Balance Sheet
Largest bank in South East
Asia with market cap of
S$60.6bn* and total assets
of S$550.8bn*.

Full Suite of
Complementary Services
DBS is a provider of the full
range of financial,
commercial and investment
banking services.

DBS is the first bank in the world to hold three of the most prestigious global bank honors at the same time.

Well positioned
at the crossroads of Asia...

... with over 280 branches
across 18 markets

*As at 31 Dec 2018
In Asia, DBS possesses a strong track record for advising and arranging non/limited-recourse financing for major players in the Power & Utilities, Oil & Gas, Natural Resources and Infrastructure/PPP sectors.

**Recently in 2018**

- **DBS COMMITTED US$1.8B** towards 23 projects that cost **US$20.9 BILLION**
- **8 Financial Advisory Mandates**
- **23 Project Finance Deals**

**Distribution of FA Mandates**

- **Power & Utilities**
- **Mining**
- **Infrastructure**

**Distribution of Debt Raised**

- **Power & Utilities**
- **Oil & Gas**
- **Infrastructure**
- **Metals & Mining**

**Since 2009, as a FA/MLA DBS has helped clients raise:**

- **19 FA Mandates Completed**
- **US$10.5b Project Debt raised**
- **US$42.9b of Project Debt for Power & Utilities**
- **US$16.6b of Project Debt for ECA and Multilateral-covered deals**
- **30,507 MW**
- **enough to power Indonesia for 13.7 months**
- **US$30.4b of Project Debt for Oil & Gas transactions**

* Indonesia consumed 234 TWh in 2017 (RUPTL 2017)
Gas Still Significant – Increasing Investment in Renewables - Energy Investment by Country Varies

Energy Investment Trends from 2010-2018

Investment in ASEAN Energy Projects, 2010-2018 (US$’ million)*

Annual Investment Growth Rate, 2011-2018 (%)*


Source: *IJGlobal – O&G includes upstream & downstream projects; Gas include gas fired power, LNG and midstream projects.
Financing Trends for Energy Projects

Over 61% of Investment Funded by Project Finance

Form of Financing for Energy Projects (US$’ million)*

Gas Projects – By Financing Option (US$’ million)*

O&G Projects – By Financing Option (US$’ million)*

Renewable Projects – By Financing Option (US$’ million)*

Sources: *IJGlobal – O&G includes upstream & downstream projects; Gas include gas fired power, LNG and midstream projects. Public Sector Finance is defined as government financing that deals with the allocation of resources in accordance with budget constraint of a public sector organization (including SOE)
Regional Trends in Financing Energy Projects in South East Asia

2018 Snapshot of Financing by Country

Key Takeaways

- **From 2010-2018**, US$124.2 billion was raised via Project Financing, US$58.8 billion via Corporate Finance and US$20.4 billion via Public Sector Finance. Project Financing has seen an annual average increase of ~4% during this period.

- **Project Finance**: Project Finance in Singapore and Philippines has declined since 2015 levels to negligible in 2018 while there is an opposite trend in Indonesia and Vietnam. Large PF deals in Indonesia were from gas and coal investments – Java 1 FSRU & CCGT Power Plant (US$1.8 billion) & Bangko Tengah (US$1.6 billion). Large PF deal in Vietnam from the coal sector – Nghi Son 2 Coal-Fired Power Plant (US$2.3 billion).

- **Corporate Finance**: Indonesia’s use of corporate finance as a proportion of ASEAN financing has declined from ~80% in 2010 to ~5.8% in 2018. As of 2018, Singapore’s use of corporate finance as a proportion of ASEAN was ~70.4% (from 0% in 2008), mainly driven by more transactions in renewables (i.e. acquisition of Equis Energy).

- **Public Sector Finance**: Picked up from 2014 onward. Malaysia’s RAPID financing (US$ 8 billion) was the largest public sector financing to date. Recently, Indonesia also raised its Green Sukuk Bond Facility (Renewables) for US$1.25 billion.

Sources: *IJGlobal – O&G includes upstream & downstream projects; Gas include gas fired power, LNG and midstream projects.*
Oil & Gas in Southeast Asia

~US$115 bn required by 2040

Key Takeaways

▪ According to the World Economic Outlook (IMF), installed power generation increases from ~241GW to ~620GW in 2040.

▪ Renewables will account for the largest share of installed capacity (~38%), followed by gas (~31%) and Coal (28%).

▪ In terms of generation capacity, coal will continue to take the most prominent role by generating ~40% of capacity followed by gas at ~28%.

▪ Based on precedent transactions* as shown in the table (left), the average cost/MW for ASEAN gas projects is ~US$1.13 million per MW.

▪ To meet the estimated growth of 101GW in gas installed capacity by 2040 (WEO, IMF), ~US$114.5 billion of cumulative investment is required.

Table 1: Precedent Transactions

<table>
<thead>
<tr>
<th>Project</th>
<th>Country</th>
<th>Capacity (MW)</th>
<th>Project Cost (US$’m)</th>
<th>Cost/MW (US$’m)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riau</td>
<td>Indonesia</td>
<td>275</td>
<td>300</td>
<td>1.09</td>
<td>2019</td>
</tr>
<tr>
<td>Chonburi</td>
<td>Thailand</td>
<td>2,500</td>
<td>1,534</td>
<td>0.61</td>
<td>2018</td>
</tr>
<tr>
<td>Java 1</td>
<td>Indonesia</td>
<td>1,760</td>
<td>1,775</td>
<td>1.01</td>
<td>2018</td>
</tr>
<tr>
<td>Myingyan</td>
<td>Myanmar</td>
<td>225</td>
<td>304</td>
<td>1.35</td>
<td>2017</td>
</tr>
<tr>
<td>Avion</td>
<td>Philippines</td>
<td>97</td>
<td>150</td>
<td>1.55</td>
<td>2016</td>
</tr>
<tr>
<td>Ratchaburi</td>
<td>Thailand</td>
<td>250</td>
<td>236</td>
<td>0.94</td>
<td>2016</td>
</tr>
<tr>
<td>Thai Binh 2</td>
<td>Thailand</td>
<td>1,200</td>
<td>1,656</td>
<td>1.38</td>
<td>2015</td>
</tr>
</tbody>
</table>

Sources: *IJGlobal
1. World Energy Outlook (IMF)
Bankable Gas Projects
Key Financing Considerations Have Not Changed

**Business Model**
- Merchant Model / Tolling Model / Integrated Model

**Project Finance vs. Corporate Finance**
- Tradeoff between higher due diligence/control and tenure

**Currency Mix**
- Revenue currency vs. Financing Currency – Hedging solutions with appropriate tenure to be considered

**Funding Sources / Liquidity**
- Consideration of potential financiers, ECA cover and Capital Market options
Enhancing Gas Delivery Infrastructure to Ensure Regional Energy Security

by Abdul Razak Saim
General Manager
Business Development & Commercial
PETRONAS Gas Berhad

10th October 2019
Yogyakarta, Indonesia
Key Messages

- Natural gas is the only fossil fuel showing growth in demand by 2040 to cater for greater energy demand amid rising electrification.

- In Asia, gas demand growth is led by China, India and Southeast Asia, enabled by infrastructure development in gas pipelines as well as LNG regasification terminals.

- Further growth in demand will only be realised through enhanced gas delivery infrastructure.
Natural gas is the only fossil fuel showing growth in demand by 2040 to cater for greater energy demand.
In Asia, natural gas demand is growing mainly in China, India and Southeast Asia.

**CAAGR**: Compound Average Growth Rate

*Source: IEA, 2018*
... with several factors that spur natural gas demand and enhancing energy security ...

SUSTAINABLE

GROWING INTERCOUNTRY CONNECTIVITY

COST EFFICIENT

ABUNDANT RESOURCES
... leading to growth in imports and spurring the development of pipelines and regasification terminals.
Further growth in demand will only be realised through enhanced gas delivery infrastructure.
Malaysia started to harness its natural gas through infrastructure development back in 1984 ...

- Monetisation of resources
- Infrastructure development (Peninsula Gas Utilisation Pipeline)
- Adding value to the nation
... leading to evolving infrastructure development which unlocks regional collaboration
Further transitioning towards industry liberalisation, from monopoly to open market for greater competitiveness

**LICENSED LNG IMPORTERS & SHIPPERS**
Any party can be an importer and/or shipper and sell directly to consumers

**GAS FACILITIES**
- Regasification Terminals
- Transmission Pipelines
- Distribution Pipelines

**RETAILER**
Supplies gas to GAS CONSUMERS through retailer’s piping system

**GAS CONSUMERS**
- Electricity Sector
- Industrial Sector
- Commercial Sector
- Residential Sector
- Transportation Sector

© 2019 Petroliam Nasional Berhad (PETRONAS)
Ultimately, we push ahead to advocate natural gas as a clean source of energy

“As an abundant and environment-friendly fuel, LNG is well-positioned to play an important role to meet the global aspiration for secure, affordable and sustainable energy.”

- President & Group CEO of PETRONAS, Tan Sri Wan Zulkiflee Wan Ariffin’s remarks at The LNG Producer-Consumer Conference in Tokyo, 30th October 2019
Thank you
Supplying Gas to Geographically Challenging Locations

Point of supply/LNG Hub

Power Plant

Industry (mining, smelter, bunkering, etc)

Retail (commercial building)