Gasification of Western Indonesian Urban Centres
A Spectrum of Related Benefits

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Consumption Growing Fast

- Energy consumption growing 3.1% /annum since 2000
- Energy consumption increasing to > 4.6% annually after 2012
- Expected energy demand in 2030 3X that of 2010
Industry currently the largest consumer in Indonesia and all projections indicate its share of energy consumption will grow as Indonesia continues to develop.

Transportation will overtake household consumption by 2015 (Indonesia Energy Outlook 2012).

### Consuming Sectors Share of Total Energy Demand

- **2010**
  - Industri/Industrial: 39%
  - Komersial/Commercial: 24%
  - Lainnya/Others: 3%
  - Rumah Tangga/Household: 31%
  - Transportasi/Transportation: 3%
Evenly split between gas & coal but **industrial use** of coal will overtake gas by **2020** (Indonesia Energy Outlook 2012)

- Natural gas cannot compete with coal on a cost of energy basis in Indonesia
  - coal ~ $2.7/MMBTU
  - gas new contracts range $5-$12/MMBTU

- Significant cost savings possible by displacing oil with either electricity or natural gas

- **Natural gas ~ 40% cost of oil** on an energy basis

- Preference for **gas instead of coal** in urban areas
Transportation - Fuel Splits & Challenges
The Energy Problem or The Energy Solution?

• Dominated by gasoline and diesel
• Burdened by production/supply imbalance
• Current (2012) supply/demand imbalance in liquids of 650,000 BPD \(^{(\text{BP Statistical Review of World Energy, June 2013})}\)
• Supply/demand imbalance has existed since 2003
• Transportation fuel subsidy in 2012 approximately 23 billion USD
  - 2.6% of GDP (World Bank) and 13.3% of Indonesian revenue \(^{\text{(The Economist)}}\)
• Indonesian government managing this issue best as possible
  Presidential Decree 5/2006 – reduce oil use by 20% by 2025
• Government roadmap for utilization of natural gas as in EMR Regulation 19/2010
  - Initiate and prioritize use of gas in urban areas where possible
• A major impediment is availability of natural gas in Western Indonesia
  - Gas from E. Indonesia primarily exported providing valuable funds to national treasury
• Costly gas infrastructure build will only occur when supply secured
Household - Fuel Splits & Challenges

The Measuring Stick for Indonesian Development

- Currently **dominated by firewood/charcoal**
  - government **LPG** (liquefied petroleum gas) **program** has displaced kerosene & firewood as fuels
  - goal of reducing household energy from firewood from 75% to 33% by 2025
  - firewood reduced to 2-3% of energy mix by 2030

- Reduction though **increased access to electricity**
  - electrical demand expected to grow 8.5% /annum
  - targeting 80% national electrification in 2014 & 93% by 2025
  - coal expected to continue displacing oil & gas for electricity generation

- Increased power generation from **natural gas** only if
  - displacing subsidized oil
  - displacing coal burning in urban centres

- Priority to reduce burning of subsidized oil
  - cost of ~ $7 billion in subsidies

**Contributing Fuel Types to Household Energy Consumption**

**Directorate General of Electricity, 2012**

**Fuel Types in Electricity Generation**
**Indonesian Energy Mix - Summary**

- **Primary drivers are** *cost* and *supply*
- **Rapid growth in Indonesia requiring expanding infrastructure & increasing energy supply**

Indonesian government challenged to get out in front of such rapid change and maintain existing pace of development

- Current dependency on coal and firewood in energy mix (~1/3rd) reflects the *abundance and affordability of coal & firewood* in Indonesia
  - coal resource of 105 billion tons (Indonesia Energy Outlook 2012)

- With national **energy demand tripling** by 2030, **coal will continue to play an important part** in Indonesia
- **Dependency on subsidized oil** will be **reduced** to protect Indonesia’s economy
- How will Indonesia’s energy mix be managed going forward?
- Can **natural gas** as a cleaner fuel than coal and a less expensive fuel than oil play a bigger role?

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**Indonesia, Gross Domestic Product (2011)**

- Indonesia 846.8 billion USD (2011)
- Malaysia 267.9 billion USD
- Singapore 239.7 billion USD

World Bank
Full Economic Benefits From Gas Replacement
A Potential Economic Engine

- Full gasification of Western Indonesia’s transportation system would reduce fuel subsidies of up to $20 billion / annum
- These funds would in turn be used to expand infrastructure and enhance social programs
  - traffic jams in Jakarta alone cost the economy at least $3 billion / annum due to wasted fuel, lost productivity and detrimental health effects (The Jakarta Post, February 10, 2011)
  - enhancing social programs (education, health, job creation) have a positive feed-back on economic development
  - increasing GDP by 1 % by improving social program effectiveness would add $9 billion / annum to Indonesian economy
- Reduced fuel costs associated with gas would mean increase in available discretionary funds for the general population
  - this would accelerate economic growth, improve living standards and quality of life
- Improvement in health would have direct economic benefits through reduction in health costs and improved productivity
- Full economic benefits estimated at $20 to $50 billion / annum
Vehicles in Jakarta emit 70% of the air pollution
- remainder from burning coal and diesel in industrial plants and electrical utilities

Gas emits low levels of NOx and SOx and reduces particulate matter (PM) by 90% compared to diesel and 99% compared to coal
- risk of premature death is 26% higher in areas of high airborne PM (Union of Concerned Scientists, 1998)

Jakarta joining numerous other Asian cities in gasifying large urban areas
- Mumbai, Kolkata, Chennai, Delhi, Bangkok, Singapore, Kuala Lumpur, Yangon, Seoul, (Iran & China)

Studies demonstrate dangers of air pollution & direct health benefits of gasification
- WHO estimates 3 million people die every year because of air pollution
- urban air pollution is to become the top environmental cause of mortality worldwide by 2050 (OECD)
- air pollution causes about 200,000 premature deaths in the U.S. annually (MIT Lab for Aviation & Environment, 2013)
- CNG program reduced annual premature deaths by > 3629 in Delhi, 5308 in Mumbai (World Bank, 2004)

Estimates of Jakarta pollution – 97,000 tons of particulate matter/annum
- the smallest (and most dangerous) of this PM (PM10) makes up 41,000 tons and is alone responsible for 4600 to 6900 premature deaths in Jakarta every year (Academic Help, Oct 15, 2010)
- including all PM & NOx, SOx pollution premature deaths may be as high as 16,000/ annum (author)
- reduction of PM in Greater Jakarta to Indonesian standards is estimated to avoid 1,200 premature deaths, 2000 hospitalizations, 40,000 emergency room visits, & save over 6 million sick days (World Bank, 1994)
Indonesia’s Roadmap to Gasification
Government is Stepping up

- Government understands the direct economic and consequential health benefits of gasification
- Government has created a roadmap for utilization of natural gas
  - EMR Regulation 19/2010
  - PR No. 61/2011 – National action plan of reducing GHG Emission
  - in 2012 MEMR initiated the fuel to gas fuel conversion program
  - kerosene replacement with LPG program commenced 2006 reduces subsidies by $5.4 billion USD annually using a cleaner fuel

- Focus is now on the use of natural gas vehicles (NGV) in Java using CNG
  - 41 CNG stations in Java and 17,300 free converter kits to public transport
  - 200 CNG stations to be built by 2015 (Jakarta Post)
  - TransJakarta buses (300 units) converted to CNG

- Expansion of national gas infrastructure underway – beginning with Jakarta
  - Ministry of Finance assessing incentives to private industry to build NGV infrastructure
  - Ministry of Industry looking at conversion kits
  - Ministry of Transport evaluation policies to encourage use of NGV in transportation industry

- What more can be done?
Gasification – The Reality Check

- **Clear fiscal benefits** from gasification of Western Indonesia
  - estimated at $20 - $50 billion / annum

- **Clear health benefits**
  - between 4600 (low) & 16,000 (high) premature deaths annually in Jakarta alone due to air pollution

**Challenges**

1. **Availability** of secure gas supply in Western Indonesia
2. **Cost of gas infrastructure**
3. **Participation** by all stakeholders

**Solutions**

- **Access to abundant, long-term gas supply** to justify infrastructure build
  - currently, government diverting valuable LNG cargo from E. Indonesia cargo to W. Indonesia
  - where is the critical W. Indonesia gas supply? Does it exist?

- Fuel subsidies can be diverted to pay for infrastructure – **gasification pays for itself**

- Stakeholder buy-in through **government incentivizing** with conversion subsidies, inspection and maintenance programs (eg. Bangkok), and natural market forces
Gasification of Western Indonesian Urban Centres
The Way Forward

- **Primary challenge** is securing long term gas supply for Western Indonesia
- Western Indonesian petroleum basins considered mature for conventional hydrocarbon exploitation
- Government has initiated and incentivized the building of the **unconventional business** in Indonesia to secure the needed long term gas supply for Western Indonesia
- **CBM (Coal Bed Methane)**
  - business initiated in 2007 – currently over 50 working areas
  - estimated resource in Sumatra of **240 Tcf** (E&P) and **200 Tcf in Kalimantan** (E&P)
  - potential commerciality in Kalimantan adjacent to Bontang LNG
  - government expecting CBM to contribute 3% of total energy requirements by 2025
- **Shale Gas**
  - as in North America, shale gas exploitation commencing later than CBM
  - regulations published early 2012
  - first shale gas PSC awarded to Pertamina May, 2013
  - first industry award expected before year-end
  - estimates of **574 Tcf** (MEMR) **Sumatra** resource estimated at **233 Tcf** (MEMR geological bureau)
Gasification of Western Indonesian Urban Centres
Sumatra Unconventional Basins

- Estimated remaining conventional 3P (proven/probable, & possible) gas resource in Sumatra of ~ 33 Tcf (IPA)
- Combined unconventional gas resource potential in Sumatra of close to 500 Tcf
- Gas pipeline already in place with available capacity for export to growing West Java markets
Gasification of Western Indonesian Urban Centres
The Way Forward
An Unconventional Solution?

- While the import & de-gasification of LNG in Java and Sumatra is already happening, the **longer-term**, most **commercially feasible solution** for the gasification of Western Indonesia lies with the **successful development of unconventional gas resources in Sumatra**
  - a combined resource potential of **500 Tcf**
  - **proximity to existing infrastructure** and pipeline systems connecting to West Java
  - **shale gas** will also contribute to the **LPG stream**, offsetting kerosene and firewood use
  - **liquids from unconventional tight reservoirs** also have the **potential to stem the decline in Indonesia’s liquid production** and under full development, generate export earnings

- Government incentivizing exploration & development of both the CBM and shale gas businesses with improved fiscal terms

- Alignment of all stakeholders remains the challenge
  - land owners
  - various ministries involved in operational execution and the commercial equation
  - existing contract leasors
Gasification of Western Indonesian Urban Centres
An Economic Win for Indonesia

- United States is an example of what the development of unconventional resources could look like in Indonesia
  “it’s difficult to overstate the shale revolution’s profound contribution to the US economy” (Chris Lafakis - Moody)

- The unconventional (shale & tight oil) boom in the US has added more than an average of $1200 of discretionary funds to every American family in 2012
  - this figure expected to grow to $2700 by 2020 (Fortune)

- This business now supports 1.2 MM jobs, and that will grow to 3.3 MM by 2020 (IHS)
  - 1 million of the 2.7 million jobs gained between 2002 and 2012 were due directly to shale drilling

- Created more than $120 billion in US based investment in 2012 (IHS)

- Contributed over $74 billion to government revenues in 2012 (US Commerce Department)
  - Expected to reach over $125 billion by 2020

- Driving growth in US GDP and is the main driver of the US economy for the last half decade (Forbes)

the stage is set for Indonesia to use unconventional development & gasification of Western Indonesia as an economic engine
Terima Kasih