THE NEW FEEDSTOCK FOR THE BIOBASED INDUSTRY
SNAPSHOT
THE NATURAL GAS INDUSTRY
## ASEAN: Energy Demand Projection

<table>
<thead>
<tr>
<th>Country</th>
<th>1990</th>
<th>2013</th>
<th>2020</th>
<th>2025</th>
<th>2035</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>89</td>
<td>196</td>
<td>252</td>
<td>282</td>
<td>358</td>
<td>6.7%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>21</td>
<td>74</td>
<td>96</td>
<td>106</td>
<td>128</td>
<td>11.3%</td>
</tr>
<tr>
<td>Philippines</td>
<td>29</td>
<td>40</td>
<td>58</td>
<td>69</td>
<td>92</td>
<td>4.8%</td>
</tr>
<tr>
<td>Thailand</td>
<td>42</td>
<td>118</td>
<td>151</td>
<td>168</td>
<td>206</td>
<td>8.7%</td>
</tr>
<tr>
<td>Rest of ASEAN</td>
<td>42</td>
<td>119</td>
<td>161</td>
<td>178</td>
<td>221</td>
<td>9.5%</td>
</tr>
</tbody>
</table>

**Primary Energy Demand by Country (MTOE)**  
Annual Growth Rate
### ASEAN: Natural Gas Consumption vs Production by Country (2012)

<table>
<thead>
<tr>
<th>Country</th>
<th>Pop (MN)</th>
<th>Consumption</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MCF/Capita/Y</td>
<td>10 Year</td>
</tr>
<tr>
<td>Indonesia</td>
<td>240</td>
<td>6.1</td>
<td>101%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>29</td>
<td>40.3</td>
<td>28%</td>
</tr>
<tr>
<td>Philippines</td>
<td>93</td>
<td>1.1</td>
<td>1330%</td>
</tr>
<tr>
<td>Thailand</td>
<td>69</td>
<td>23.0</td>
<td>90%</td>
</tr>
<tr>
<td>Singapore</td>
<td>4</td>
<td>67.4</td>
<td>612%</td>
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</tbody>
</table>
TRANS-ASEAN GAS PIPELINE

- 10 Cross Borders Pipelines
- USD 14 Billion Investment
- Over 3900 KM Length
- Transports 3100 MMCFD

Legend:
- Green line: Oil pipeline
- Green dashed line: Oil pipeline (planned/under construction)
- Red line: Gas pipeline
- Red dashed line: Gas pipeline (planned/under construction)
- Blue line: Products pipeline
- Blue dashed line: Products pipeline (planned/under construction)

Map showing the Trans-ASEAN gas pipeline network linking various cities and countries in Southeast Asia.
MALAYSIA
GAS CONSUMPTION
BY SECTOR

Gas Consumption (mmBtu) (Supplied by GMB)

Industry: 137,246,099
Commercial: 961,562
Residential: 36,627
MALAYSIA: GAS IMPORT & EXPORT VOLUME

Source: Department of Statistics, Energy Commission
NATURAL GAS ALLOCATION IN MALAYSIA

<table>
<thead>
<tr>
<th>Year</th>
<th>LNG - MARKET DRIVEN PRICE</th>
<th>GOVERNMENT REGULATED PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>150 MMSCF/D</td>
<td>150 MMSCF/D</td>
</tr>
<tr>
<td>NOV 2009</td>
<td>300 MMSCF/D</td>
<td>300 MMSCF/D</td>
</tr>
<tr>
<td>DEC 2009</td>
<td>382 MMSCF/D</td>
<td>382 MMSCF/D</td>
</tr>
<tr>
<td>JAN 2013</td>
<td>422 MMSCF/D</td>
<td>422 MMSCF/D</td>
</tr>
<tr>
<td>JAN 2014</td>
<td>452 MMSCF/D</td>
<td>452 MMSCF/D</td>
</tr>
<tr>
<td>AUG 2014</td>
<td>452 MMSCF/D</td>
<td>452 MMSCF/D</td>
</tr>
<tr>
<td>2015</td>
<td>492 MMSCF/D</td>
<td>492 MMSCF/D</td>
</tr>
</tbody>
</table>
THE OPPORTUNITY FOR BIOGAS INDUSTRY IN MALAYSIA
2 BIOGAS

MARKET SIZE OF THE INDUSTRY
MARKET SIZE OF THE INDUSTRY (2022)

PHILIPPINE: RM 6.5 BILLION
MALAYSIA: RM 8.3 BILLION
THAILAND: RM 12 BILLION
INDONESIA: RM 18 BILLION
SOUTH EAST ASIA: RM 45 BILLION

GLOBAL MARKET:
RM 120 BILLION

Source: Pike Research (Cleantech management report)
TOTAL INSTALLED BIOGAS PLANTS AS OF 2014

- Malaysia: 68 BioGas Plants
- Thailand: 1,010 BioGas Plants
- Indonesia: 20 BioGas Plants
434 PALM OIL MILLS
20 MILLION MT CPO
1 BILLION M3 METHANE
MALAYSIA
MALAYSIA

RM 2.6 BILLION
Installation of anaerobic digesters facility

RM 10.2 BILLION
Installation of power generation facility & FiT

RM 4.4 BILLION
Installation of compressed biogas facility & sales of CBG

POTENTIAL MARKET SIZE: 2022
MAPPING OUT
THE RENEWABLE
ENERGY LANDSCAPE
(Power Grid)
in Peninsular
Malaysia
2 BIOTECHNOLOGY

ADDING VALUE TO

THE BIOGAS INDUSTRY
THE CONVENTIONAL PRACTICE OF BIOGAS INDUSTRY
RM 8.3 BILLION INDUSTRY
BIOTECHNOLOGY: THE GAME CHANGER & VALUE CREATOR FOR THE BIOGAS INDUSTRY
THE

BIOTECHNOLOGY

APPLICATIONS
ADDRESSABLE MARKET FOR BIOBASED PRODUCTS

DIESEL $809B
JET FUEL $309B
BULK POLYMERS $309B
SYNTHETIC & NATURAL RUBBER $13B
SURFACANTS $22B
AUTOMOTIVE LUBRICANT $24B
PLASTIC ADDITIVES $37B
INDUSTRIAL LUBRICANT $24B
COSMETICS, FLAVOURS & FRAGRANCES $32B
ANAEROBIC DIGESTERS

POWER GENERATION

MICROBES / ENZYME FORTIFICATION

OPTIMIZED BIOGAS YIELD (INCREASED EFFICIENCY)

FARNESENE BIO-GASOLINE

BIO-METHANOL

BIO-ETHANOL

BIO-ETHYLENE

LIQUEFACTION BIOGAS

BIO-DME

PROTEIN FEED

BIO-AMMONIA

1980'S

1990'S

2000'S

2010

2015

2018

2020

BIOTECHNOLOGY PROCESS

CONVENTIONAL PROCESS
In the Philippines, Aboitiz Equity Ventures has set up a JV with Gazasia called Aseagas Corporation and will invest in a 9,000 ton per year biogas liquefaction plant co-located a sugarcane mill in Batangas Province as its first project. The fuel will be used to power buses and trucks. Cryostar will build the liquefaction machinery.

May 29, 2014
4 MALAYSIA: ECONOMIC ANALYSIS
MALAYSIA: ECONOMIC ANALYSIS

POWER GENERATION
(within 10km radius from grid)

INVESTMENT
RM18 MILL

OPEX
RM720,000

PROFIT
RM1.20 MILL/YR

COMPRESSED BIOGAS
(within 250km radius from nearest offtaker)

INVESTMENT
RM25 MILL

OPEX
RM2.7 MILL

PROFIT
RM1.8 MILL/YR

*Based on 60 MT/Hr FFB Processing Capacity Palm Oil Mill
**MALAYSIA: IMPLEMENTATION STRATEGY**

**PHASE 1**
(2015-2020)

**BIOGAS**
All palm oil mills equipped with biogas facility by 2020

**PHASE 2**
(2015-2020)

**POWER**
30% of palm oil mills located within 10km radius from grid

**PHASE 3**
(2016-2024)

**CBG**
70% off-grid mills, equipped with upgrading facility for CBG

**PHASE 4**
(2018-2028)

**LIQUEFACTION & GRID INJECTION**
Reduces logistics cost by 4X compared to CBG transportation cost

**PHASE 5**
(2020-2030)

**BIOTECH**
Those located beyond 250km radius from nearest offtaker to adopt downstream production
ECONOMIC IMPACT

BIOGAS INDUSTRY
BIOECONOMY
RM 150 BILLION

Biogas contribution:
RM20.2 B (15%)

BIOGAS CONTRIBUTION
BIOECONOMY MALAYSIA

GNI BY 2020:
RM2.4 BILLION

EMPLOYMENT:
27,000
6 MALAYSIA: INCENTIVES
INCENTIVES FOR BIOGAS INDUSTRY

- Pioneer Status
- Bionexus Status
- Investment Tax Allowance
- Import Duty Exemption
- Green Tech Financing Scheme
BIONEXUS STATUS: HOW IT WORKS?

- Deduction on Investment Made into the Company
- Tax Deduction for Tech Acquisition
- Import Duty Exemption Pilot Plant
- 10 Years Tax Exemption on Statutory Income
- Concessionary Tax Rate of 20% for 10 Years
- Tax Exemption on Dividend Repatriated
- Double Deduction on Export Promotion
- Double Deduction on R&D

PROFIT

A&P

R&D
BIOGAS MALAYSIA

WAY FORWARD
THE TARGET:

ALL 434 PALM OIL MILLS ARE EQUIPPED WITH BIOGAS FACILITY BY 2020, THUS ACHIEVING 50% OF OUR COP-15 COMMITMENT

10% OF DOMESTIC NATURAL GAS REQUIREMENT OR 50MMSCF/D IS SUPPLIED FROM BIOGAS BY 2030

250MW OF OUR NATIONAL ELECTRICITY REQUIREMENT IS SUPPLIED USING BIOGAS BY 2025
<table>
<thead>
<tr>
<th>STRENGTHS</th>
<th>CHALLENGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORLD CLASS COMPANIES &amp; CONGLOMERATES i.e. SIME DARBY, PETRONAS, FELDA, GENTING, IOI</td>
<td>LIMITED AREA FOR PLANTATION EXPANSION, FORCING PALM GROWERS TO VENTURE FURTHER DOWNSTREAM</td>
</tr>
<tr>
<td>READY &amp; WELL-ESTABLISHED INFRASTRUCTURE, DEDICATED, CUSTOMIZED INDUSTRIAL PARKS</td>
<td>LIMITED TECHNOLOGY KNOW-HOW, WILL REQUIRE STRATEGIC PARTNERSHIP WITH TECHNOLOGY PROVIDERS</td>
</tr>
<tr>
<td>ADVANCED ENGINEERING CAPABILITIES FROM BOTH PALM OIL &amp; THE PETROCHEMICAL INDUSTRIES</td>
<td>LIMITED EXPERIENCE IN SCALING UP BIO-BASED PROJECTS</td>
</tr>
<tr>
<td>PROVIDE OPPORTUNITIES TO COMPLEMENT WITH THE STRATEGIC PROJECTS. i.e. PETRONAS RAPID, JOHOR &amp; PETRONAS GIPC, KUANTAN</td>
<td>VERY COMPETITIVE REGIONAL INVESTMENT LANDSCAPE</td>
</tr>
</tbody>
</table>
To ensure **seamless implementation** of the biogas applications:

- **Work closely with industry players** to strategize on the grid connection strategy
- **Enhance awareness within the palm oil industry players** on the economics potential of biogas
- **Appropriation of infrastructure grant from the renewable energy fee** collected by SEDA for biogas to electricity grid connection
- **Economic Corridors Agency** to provide **biogas storage tank facility** within their park for downstream consumers
BIOTECHCORP’S ROLE IN BIOGAS INDUSTRY

- **To take the initiative** to consolidate with the myriad agencies and stakeholders in the industry to create a commercial path for the development of biogas in the country.

- **To support the national strategy** to emphasis on research and development in biogas industry and to turn biogas into higher value products.

- **Using Biotechnology** as the game changer of the Bioeconomy of the country.
THANK YOU