Renewable Natural Gas - Bio CNG

- Biogas with MethGEN™ Technology
- Transportation Fuel
- Mess Cooking Fuel
- Gen-set Backup replacing Diesel
Waste water streams from the following Industries:

- Distilleries
- Pressmud/Bagasse
- STP (Municipal solid, liquid and landfills)
- Food-Agro Processing units (starch-palm-food etc)
- Animal droppings-(pig-poultry-cattle etc)
- Dairy
- Farm Waste (Rice husk, straw etc.)
What is Bio-CNG?

Purified Biogas is called Bio CNG

- Bio CNG is *renewable Natural Gas*
- Bio CNG is exactly similar to Natural Gas in composition and properties
- It is a direct replacement of NG and for applications of LPG

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Biogas</th>
<th>Bio-CNG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane (v/v)</td>
<td>55-65%</td>
<td>92-98%</td>
</tr>
<tr>
<td>$\text{CO}_2$ (v/v)</td>
<td>35-45%</td>
<td>2-8%</td>
</tr>
<tr>
<td>$\text{H}_2\text{S}$ (ppm)</td>
<td>500 – 30,000</td>
<td>&lt;20 ppm</td>
</tr>
<tr>
<td>Moisture (deg C dew point)</td>
<td>Saturated</td>
<td>&lt; -40 deg</td>
</tr>
<tr>
<td>Other Impurities (e.g. Siloxanes)</td>
<td>Present</td>
<td>Not present</td>
</tr>
<tr>
<td>Calorific Value (LCV)</td>
<td>~ 19500 kJ/kg</td>
<td>~ 52000 kJ/kg</td>
</tr>
</tbody>
</table>
Potential of Bio CNG in India

• High potential industries for Biogas:
  – Primary: Distillery, Sugar, and Starch (75% Biogas)
  – Secondary: Pulp and paper, Milk processing, Slaughter house, and Poultry
## Fuel: Value per Rupee

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Calorific Value</th>
<th>Tariff/Rate/Cost</th>
<th>Cost of Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNG</td>
<td>52000 kJ/kg</td>
<td>Rs. 38.0/kg</td>
<td>1368 KJ/Rs.</td>
</tr>
<tr>
<td>Purified Biogas</td>
<td>52000 kJ/kg</td>
<td>Rs. 20/kg *</td>
<td>2600 KJ/Rs.</td>
</tr>
<tr>
<td>LPG (Commercial)</td>
<td>46000 kJ/kg</td>
<td>Rs. 65.7/kg</td>
<td>700 kJ/Rs.</td>
</tr>
<tr>
<td>Auto LPG</td>
<td>46000 kJ/kg</td>
<td>Rs. 74.0/kg</td>
<td>621 kJ/Rs.</td>
</tr>
<tr>
<td>LPG (Domestic)</td>
<td>46000 kJ/kg</td>
<td>Rs. 27.5/kg</td>
<td>1673 kJ/Rs.</td>
</tr>
<tr>
<td>Petrol</td>
<td>48000 kJ/kg</td>
<td>Rs. 65.5/ltr</td>
<td>550 kJ/Rs.</td>
</tr>
<tr>
<td>Diesel</td>
<td>44800 kJ/kg</td>
<td>Rs. 41.3/ltr</td>
<td>900 kJ/Rs.</td>
</tr>
</tbody>
</table>

* Based on industrial ETP biogas

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*Energy Availability per Rupee (in India)*

- CNG
- Purified Biogas
- LPG (Commercial)
- Auto LPG
- LPG (Domestic)
- Petrol
- Diesel
Sweden: An example

**Sweden** plans to be World's first oil-free economy by **2020**

Most of the heating requirement of this cold country is met through Bio-CNG.

Bio-CNG is pushed in to NG pipeline

Train trial run on Bio-CNG in Sweden
Identify & establish biogas sourcing & plant lease agreement

If H$_2$S > 1500 ppm, Desulphurize

Upgrade biogas to CNG composition

Compress & bottle greenCNG™

Sale agreement w/ Industrial Kitchens

Provide CNG-LPG conversion kit & supply ready-to-use Cylinder Cascade

Biogas to Bio CNG (Renewable Natural Gas)
Closed Loop Recycling System

Biogas Source
- Distilleries
- Breweries
- Paper and Pulp
- Tanneries
- Slaughterhouses
- STPs
- Palm Oil
- Starch
- Food Processing

Biogas to Bio CNG Conversion

Bio CNG Sale
- Vehicular Fuel
- Food Processing
- Bakeries
- Plastic Molding
- Ceramics/Tiles
- Glass
- Steel
- Rubber
- Large Kitchens
- Hotels/Restaurants
- Others using fuel gas

Bio gas to Bio CNG plant
Govt. Policy, Role & Support

- MNRE subsidy scheme: ‘Biogas Generation and Fertilizer Program (BGFP).
  - Under BGFP, 50% capital subsidy was given for biogas purification systems till 11th 5 year Plan.
- Biogas purification is a CDM based CER eligible project.
- BIS standards for purified biogas as approved fuel are developed & due notification.
- 100% depreciation in first year for scrubbing units, if classified as air pollution control equipments
- Better loan terms
- REC based certificates for fuel RTFC will be the next step. (US/UK/Australia)
India: Getting Started

• First few projects taken off:
  – Warana Sugar, Warana Nagar
  – Kisan Veer Satara SSK, Satara
• BIS standards to be notified
• ARAI (Automotive Research Association of India) to permit vehicular use of Bio-CNG
• Pipeline model to be implemented
About us

• We are a company of IIT and Harvard Alumnus based at Delhi.

• GBES is a company engaged in the design and manufacture of specialized purification equipments for industrial scale biogas. We also deal in water treatment by providing solutions to industry and real estate projects.

• GBES has been founded by five IIT alumnus and has a MOU with IIT and BARC (Bhabha Atomic Research Centre) for further R&D and technology transfer.

• In this short period bagged orders and signed MOU for application and installation of methGEN™ in India and Malaysia.

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Thank you.