SHARING BIOENERGY EXAMPLES

BIOETHANOL IN THAILAND

Ensuring Access to Bioenergy Globally

24th June 2013

European Parliament
Global Process Engineering Solutions Company

Technology, Equipment and Services for Ethanol, Brewery, Water, Wastewater and Critical Process Equipment for industrial application as well biobased products and processes.

More than 500 references across 50 countries

World Class R&D Center – Praj Matrix

Present in Southeast Asia for over 2 decades with the office in Thailand

Set up 12 bioethanol plants in Thailand......Market Share of 60% in supplying technology & equipment for ethanol plants in Thailand

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Thailand
Prudent Approach Towards Bioethanol Blending

Population – 66 million
Area – 513,120 sq. Km
GDP (nominal, est. 2012) - $365 billion
Agriculture - 70% employment & 8.4% of GDP
Major Agro-Products – Rice, Rubber, sugarcane, Cassava

A nation ranked 20th in terms of population is now ranked 6th in terms of biofuel consumption

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Thailand
Need for Alternate Energy

Energy - Proportion of Import & Domestic Production (2011)

<table>
<thead>
<tr>
<th>Energy</th>
<th>Domestic Production</th>
<th>Import</th>
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</thead>
<tbody>
<tr>
<td>Crude Oil</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>74</td>
<td>26</td>
</tr>
<tr>
<td>Coal</td>
<td>67</td>
<td>33</td>
</tr>
<tr>
<td>Electricity</td>
<td>95</td>
<td>5</td>
</tr>
</tbody>
</table>

Energy Consumption (2012)
73,316 ktoe

- Oil for transport: 35%
- Oil for industry: 22%
- Electricity: 19%
- Coal: 12%
- Natural Gas: 10%
- Lignite: 2%

Estimated Energy Consumption (2021): 99,838 ktoe (35% rise from current level)

Source: Ministry of Energy, Thailand
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Ethanol Blending Policy (2012) - Objectives 2021

- Reduce import bill – strengthen energy security
- Replace fossil fuels – become leading Low Carbon Society
- 25% Alternate energy in total energy consumption by 2021
- Energy Conservation & Efficiency
- Monitor Energy Prices & Safety

Biofuels
- Ethanol – 9 million liters per day (from existing 1.4 mlpd and expected to replace 44% of oil)
- Other – 31 million liters per day

Source: Ministry of Energy, Thailand
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Solar – 2000 MW
Wind – 1200 MW
Hydropower – 6108 MW
Bioenergy (Biomass) – 4390 MW
Thailand
Ethanol Supply Chain - Stakeholders

**Feedstock**
- Molasses (from sugar industry)
- Cassava

**Ethanol Plant**
- Converting feedstock into Ethanol and other bi-products (CO2, Biogas)

**Market**
- International Fuel Market
- Domestic Fuel Market

**STAKEHOLDERS**

- Farmers
- Merchants
- Processing plants

- Ethanol Producers
- Technology suppliers
- R&D

- Oil Refineries
- OMCs
- Fuel Retailers
- Automotive Industry

- Consumers
- Government & Various Ministries

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Government Support – Drivers for Stakeholders

**Agriculture Sector**
- Yield improvement of Sugarcane and Cassava by supporting R&D activities
- Quota (35%) for Cassava based ethanol to accommodate increasing demand of ethanol
- Cassava based ethanol to fetch 3 Baht per liter more price than Molasses based ethanol

**Automotive Sector**
- Support manufacturing of E85 cars by reducing excise tax to car makers
- Requirement of E85 cars procurement for official /government agencies
- Support research to increase ethanol demand e.g applying conversion kit for old cars

**Fuel Market**
- Sell of non blended fuel is prohibited at fuel retail stations from Jan 2013
- Setting up price of E20 lower than that of Gasohol 95 and E10
- **Price benchmarks**
  - Ethanol feedstock Price
  - Brazilian ethanol Price
  - International Crude Oil Price

**Energy Content (MJ/L)** | **Price (Baht/L)**
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Gasoline (UGR 91 RON) | 34.2 | 43.65
Gasohol 91 E10 | 33.2 | 35.78

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Case Study – 100 m3/d Molasses based Ethanol Plant

Key Parameters

Steam from Bagasse based Boiler

Sugarcane Molasses (430 m3/d) → Ethanol Plant

- Ethanol (100 m3/d)
- Effluent (1200 m3/d)

Biogas 55% Methane (45000 m3/d) → Electricity (100 MWh/d)

Electricity to Grid (62 MWh/d)

Emission Reduction – 637.675 tCO2e over 10 years

Typical GHG savings – more than 90% compared to fossil fuel

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Advantages Bioethanol

**Economic Benefits**
- Hard currency savings by replacement of 44% of oil import
- Creation of thousands of direct jobs and indirect jobs in rural area

**Environmental Benefits**
- High GHG Savings – Better air quality
- No land use change

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Key Success Factors for Bioethanol

- Clarity & consistency in policy
- Availability of raw material – Molasses & Cassava
- All stakeholders on board
- Pricing transparency across the value chain
THANK YOU

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