Development of Commercial Biogas in Thailand

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Background

- Nearly 200 industrial biogas plants built in last 10 years
- Biogas has increased energy efficiency and competitiveness for starch and palm oil mills
- 10 years ago difficult to obtain financing, now local banks provide loans
1. RE policies & regulations
2. Biogas development over last decade
3. Factors driving biogas development
4. Main issues & risks
ENCON Act (1992)

- Compulsory and voluntary programs to stimulate energy conservation
- Major factories and buildings required to prepare energy audits and energy conservation plans
- Awareness campaigns, appliance labeling
- Established ENCON Fund
ENCON Fund

- Funded by the Petroleum Fund, based on a levy on the domestic sales of fossil fuels
- Annual budget of US$ 5 million
- Supports multiple EE and RE programs:
  - 30% Subsidy Program
  - Tax incentives
  - Energy Efficiency Revolving Fund

- Low-interest loans to local banks for on-lending to clients
- Loans up to US$ 1.7 million, interest rate max 4%, maximum 7 years
- 13 public and commercial banks participated, US$ 500 million loans to 250 projects
- Instrumental in familiarizing banks with RE
Currently Alternative Energy Development Plan (2012–2021)

- Target to increase RE to 25% by 2021
- Biogas target increased from 120 to 600 MW
Very Small Power Producer (VSPP)

- Distribution utilities obliged to purchase electricity generated from RE up to 10 MW
- Retail tariff + ‘Adder’ (US$ 1.0–1.7 cents / kWh for biogas)
- By October 2013, 1,329 MW connected, 3,510 MW under development
2. Biogas Development in Thailand

- HH biogas programs since 1950s
- Medium and large pig farms in 1990s
- Early 2000s government supported projects at starch mills (30% subsidy)
Opportunity at Starch Mills

- Waste water typically treated in open lagoons
- High organic content suitable for biogas
- Large industrial sector
- Industry relies on Heavy Fuel Oil and grid electricity

Biogas can significantly reduce energy costs and environmental impacts
10 year BOOT (Build–own–operate–transfer)
Covered lagoon digester (100,000 m³)
CAPEX US$ 4.5 million (all equity)
Fixed savings of 20%
3 MW, displaces 7.5 m. liter HFO, 35 GWh/yr
Projected 250,000 CERs/yr
BOOT Structure

Starch Mill

Wastewater

Biogas

Electricity

Special Purpose Vehicle

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Biogas Boom

- High expectations from CDM
- Initially BOOT, later mostly turn-key
- Since 2003, 50 plants at starch mills, 60 at palm oil mills
- Sharp increase in biogas power sales
Electricity Sales from Biogas

- 87 projects, total 193 MW, 176 MW under development
- Biogas 15% of VSPP capacity
- Revenue since 2005 > US$ 150 million
- Palm oil mills energy self-sufficient, so VSPP important factor
Univanich Palm Oil

- Biogas initially to solve odor problem
- Extra revenue from electricity (6,000 MWh/yr) and carbon (27,000 CERs/yr)
- Company built 2 more biogas plants
<table>
<thead>
<tr>
<th>Year</th>
<th>Electricity (GWh)</th>
<th>Capacity (MW)</th>
<th># Projects</th>
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<tr>
<td>2005</td>
<td>2</td>
<td>7</td>
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<td>2012</td>
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Finance

- Grant funding for early projects
- Large interest from carbon finance
- Most later projects financed by local banks, EERF co-financed 30–40 projects
- Local banks willing to finance once familiar, but largely as asset–based corporate finance
- Total investment US$ 400–500 million
Current Status & Prospects

- Most major facilities have biogas system
- Opportunities at smaller facilities, but not always economically feasible
- Scope for performance improvements at existing plants
- Opportunities for other feedstock but higher costs and less standardized
3. Driving Factors

- Favorable regulations & incentives:
  - RE development plans & targets
  - Subsidies, tax credits, financing
  - VSPP
Driving Factors (2)

- Carbon finance:
  - High expectations, low deliverance
- Well–established industrial sector:
  - Replicability, access to financing
- Favorable investment climate:
  - Infrastructure, stability, etc.
4. Main Issues & Risks

- Wastewater quality and volume:
  - High COD and BOD
  - Fluctuations and disruptions in delivery of the waste stream
  - Changes in waste stream composition
Main Issues & Risks (2)

Technology:
- Different technologies like covered lagoon, UASB, have different strengths & weaknesses
- Tolerate fluctuating volume and quality of waste water supply
- For biogas gensets, install gas scrubbers to remove highly corrosive hydrogen sulfide from biogas
Main Issues & Risks (3)

- Operation & Maintenance:
  - Biogas not part of core business
  - Under–qualified operators can lead to inefficient operation or shut down
  - Lack of communication between factory and biogas plant can affect performance
In Conclusion

- Industrial biogas is a mature and bankable technology
- Highly suitable for agro-industries with high energy demand
- Favorable regulations and access to finance key to uptake