Biogas
Fuel Source for a Renewable Future

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Lessons Learned from Biogas Study Tour
Energy Planning Principles:

- Reduction of overall energy consumption
- Replacement of fossil energy sources by renewable ones, especially wind, water, biomass and solar energy
- Priority for cogeneration and district heating systems, especially those based on waste energy and biomass;
- Reduction of environmental impacts.
Other Jurisdictions Have taken Steps to Maximize the Implementation of Renewables and Capture the Efficiency of Cogeneration and District Energy

- **Wind**: Install as much wind as the grid can accommodate
- **Biomass**: Capture of all forms of methane including Landfill, WWTP, Municipal Waste, Animal Waste, Agricultural Waste, Energy Crops
- **Cogeneration / District Energy**: Whenever possible generate power where the thermal loads are
- In order to develop a sustainable energy infrastructure decisions have to be value driven, not cost driven
Biogas
Fuel source for a renewable future

• Technology
• Project Examples
• Ontario Opportunity
• Drivers & Barriers
Organic Matter is everywhere

Municipal waste
Manure
Yard waste
Wood waste
Expired food
Slaughterhouse waste
Energy Crops
EFFECTS OF UTILIZING BIOGAS TECHNOLOGY

- renewable energy supply – CO₂-reduction
- reduction of CH₄-emission
- decentralised energy supply
- diversification of agricultural income
- strengthening of rural infrastructure
- security of energy supply
- saving of mineral fertilizers
- reduction of odour emission
Anaerobic Digestion of Biomass

Diagram showing the process of anaerobic digestion of biomass, including gas flare, biogas, digestion, gasometer, heat exchanger, primary pit, and electrical energy for agricultural use.
Biogas plants in Germany

775 Biogas Utilization Plants
Utilization of Farm Scale Biogas in Germany – Development

- Number of plants
- Installed electric power [MW]

Graph showing the development of farm-scale biogas utilization in Germany from 1992 to 2005 (estimated).
## Biogas – Development (Germany)

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installed power</td>
<td>550 MW</td>
<td>10.000 MW</td>
</tr>
<tr>
<td>Electricity from biogas</td>
<td>2.8 TWh/a</td>
<td>76 TWh/a</td>
</tr>
<tr>
<td>Jobs Created</td>
<td>5,000</td>
<td>85,000</td>
</tr>
<tr>
<td>CO2 Emission Reduction</td>
<td>4 Million t/a</td>
<td>103 Million t/a</td>
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GE Energy Jenbacher gas engines
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330 kW – Farm Sized Biogas Fuelled Cogeneration Plants

1 x JMC208
Electrical Output: 330 kW
Thermal Output: 421 kW
AD of biomass St. Veit/Glan / Austria

St. Veit /Austria

1 x JMC 320 GS-B.LC

Electrical Output: 1,065 kW
Thermal Output: 1,052 kW
Biomass Digestion of Municipal Waste

Siggerwiesen/Austria
3 x JMS 316 GS B/L.L

Plant Output
1,629 kW_{el}
Thermal Output
2,373 kW

Biomass
19,900 to/year

Biogas production
3,036,000 m³/year

Compost production
4,950 m³/year

Landfill gas
2,371,000 m³/year

Electricity production
6,510 MWh/year

Heat production
3,260 MWh/year
Advanced Composting – Passau
20,000 t/year of Municipal Waste
Passau – 2 x 1 MW District Energy Plant Fuelled by Biogas
Bio-Energy Cycle - Okostrom in Mureck

Winner of 2001 World Energy Globe Awards

BioDiesel Production: 6,000,000 l/year
Biomass District Energy: 6 MWth
Biogas Cogeneration Plant: 1 MWe
CO2 savings: 30,000 t/a
Integrated Manure Utilization System
Vegreville - Alberta
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Biogas Yields of Different Feed Stocks

- waste wheat
- waste bread
- grease trap contents
- corn-cob-mix
- corn silage
- grass silage
- food waste
- municipal biowaste
- potatoes
- beet
- grass cuttings
- potato peelings
- pig manure
- cattle manure

Std. m³ biogas / ton
Ontario Opportunity

- 5.6 Million ha of agricultural land
- Based on the German example, the integrated use for production of food, feed and energy crops could generate 3700 m3/ha/year of methane
- This is enough gas for almost 9000 MW of electrical capacity
- Biogas power plants with gas storage can operate as peaking plants
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Biogas conversion through anaerobic digestion generates more energy from organic matter than any other technology.
What are the drivers for implementation

Kyoto commitment

Value of CO2 reduction

Reduce dependency on fossil fuels

Utilize local resources for energy needs

Generate Power where thermal loads are

Consumers accept the fact that there is a cost associated with preserving their environment and developing a sustainable energy infrastructure.
Yes, it is also possible in Ontario

Define the potential
Create an Energy Vision (Where do we want to be 20-30 years from now)
Involve all stakeholders (agriculture, environment, energy, municipal etc.)
Set specific implementation targets (Germany example: 10,000 MW by 2020)
Introduce regulatory and financial incentives to achieve these targets (Consider tariffs similar to Germany and Austria)
Annually review and adjust incentives/regulations in order to stay on track
Make it easy and attractive to invest in these projects
Thank You

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