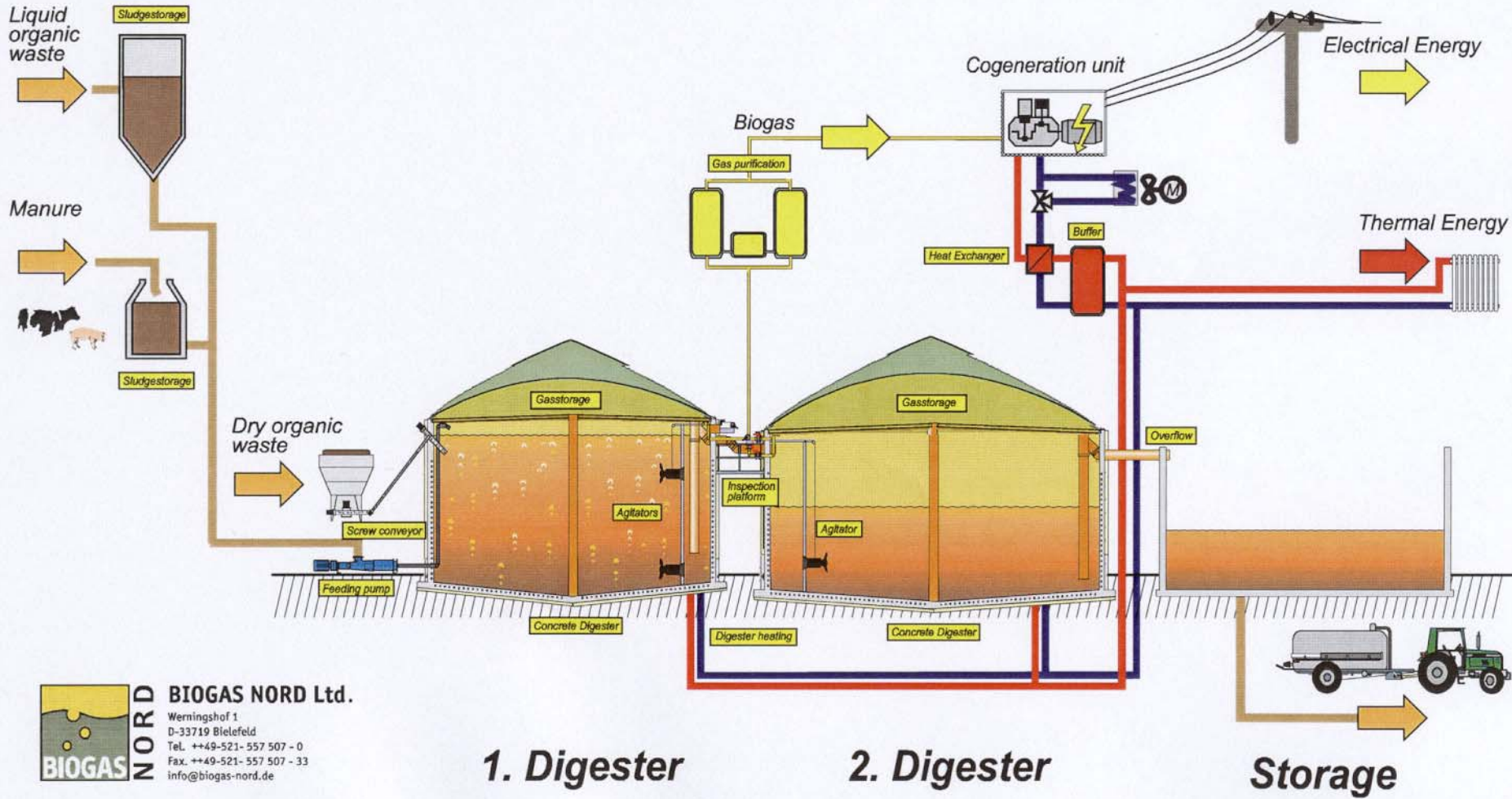




Biogas on the farm: economically viable options today?

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Opportunities for economical systems today

Three General Categories:

- Farm-based inputs, with high-quality off-farm materials, electricity premium, low-cost system, and possibly with a grant
- Capture of economic returns from additional benefits
- Ontario Biogas Systems Financial Assistance Program

Category 1- Klaesi Farm

- Operating since 2003, 140 milking cows
- Scaling up to 100 kW generator from 50 kW
- Obtained a Certificate of Approval to receive off-farm materials to blend with manure at a 10% to 25% ratio
 - Expect energy yield to double
- Previously Net Metering
 - Recently signed a Standard Offer Program contract





Category 1 - Terryland and Pinehedge Dairy Farms

- Heinzle Brothers
- 180 kW and 100 kW
- Commissioned Summer 2007
- Genesys Biogas
- Conventional mesophylic completely mixed digester



Category 2 - Bayview Flowers Greenhouse

- Flower greenhouse
- 250 kW containerized co-gen unit
- Plan-ET biogas (Germany)
- Commissioned summer 2007
- Heat for greenhouse & use of high-grade purchased inputs



Basic Rules in On-Farm Mixed AD Regulations

Ontario Regulation 267 – Nutrient Management Act

- Max 5000 m³/year
- Max 100 m³ on-site
- Max 25% by volume off-farm materials
- Of remaining ag material, half must be manure
- 3 Lists of Materials (called Schedules)
 - Permitted materials - (primarily food processing and pre-consumer food products and byproducts)
 - Permitted materials with pre-treatment (70°C for 1 hour or 55°C for 20 hours) - (primarily meat plant products)
 - Excluded materials (includes “post-consumer” material)
- Nutrient Management Strategy, record keeping
- Effluent (digestate) treated as Ag Source Material

- Also, if C of A for inputs, but >50% Ag Source Material, then digestate treated as Ag Source Material





Energy Crops

- High energy-density compared to manure – allows bigger digester
- Corn silage yield:
 - 6500 kWh per acre per year (electrical + equal heat)
 - vs. 1800 kWh per cow per year from manure
- Value of corn silage: \$25 to \$30/wet tonne
 - can capture ~350 kWh of electricity and 300 kWh of heat per wet tonne
 - if 12¢/kWh for electricity and 5¢/kWh for heat
 - gross energy of \$57 per tonne
 - Sounds good!
 - BUT still have to pay back the capital cost of the digester, generation equipment, etc.
- Best applied if opportunity to use 100% of heat from co-gen unit, or if higher electricity value could be secured
- 10% of energy produced is required to grow, harvest, transport and digest crop

Category 2 - Value from Digestate

- Solid/liquid separator:
 - Solids:
 - Bedding Material
 - Fibre material for plastic reinforcement ?
 - Peat-like product for horticultural market
 - Liquids likely land-applied according to good agronomic practice



Ontario's Standard Offer Program

Higher price for energy from renewable or clean sources

- **final contract details November, 2006**
- **11 ¢/kWh, basic**
- **14.52 ¢/kWh for peak power**
 - **Blended price at 8000 hours operation = ~11.9 ¢/kWh**
- **OMAFRA Infosheet Available**

Connecting to the Electrical Grid

- Connection Impact Assessment
- Key first step of any electrical project
- Requirement by local electrical utility to determine line capacity, impact on neighbouring facilities etc.
- Limits on total line capacity, and capacity at local transformer station (TS)
 - Significant problem in areas of high wind: all capacity at TS is accounted for
- Queue: 1300+ applications
 - “Expedited Process” for biogas systems <500 kW



Overview of the Biogas Funding Program

Goals:

- Kick start biogas sector
- Reduce climate change emissions
- Build ~30 biogas systems



BIOGAS SYSTEMS FINANCIAL ASSISTANCE PROGRAM

Guidebook

Applying for Funding

- First come, first served basis for projects that meet eligibility criteria
- **Phase 1**
 - feasibility, design, and planning studies
 - 70% cost-share, \$35,000 max
- **Phase 2**
 - construction, implementation, and commissioning
 - 40% cost-share up to \$400,000 max (less any Phase 1 funding)
 - Phase 2 needs building permit with application if required
- Can apply to Phase 1, 2, or both

General Eligibility Criteria

- Eligibility criteria of an anaerobic digester project :
 - the project uses at least 75% agricultural or food-based products or by-products,
 - the project produces biogas for use in the production of electricity or heat or for fossil fuel replacement, *and*
 - the project manages digestate in a manner that avoids landfill or sewage disposal
 - typically, land application

What can be funded

- Phase 1: Feasibility, planning, and design
 - feasibility studies
 - engineering designs
 - costs required to secure a building permit
 - electrical connection impact assessment application costs
 - costs to demonstrate technical feasibility of biogas utilization
 - contract development fees
 - legal fees
 - business advisory costs
- Eligible expenditures incurred since January 1, 2007 allowed for both Phases
- Phase 2: Construction, implementation, and commissioning
 - pumps, piping, pipelines
 - biogas utilization equipment (electrical generation system, boilers, biogas cleaning systems, compressors)
 - electrical equipment and controls
 - heat transfer and recovery equipment
 - digester tanks, storage tanks
 - flares
 - augers
 - pasteurization systems
 - digestate treatment systems
 - structures for system
 - gas storage systems
 - electrical hook-up equipment

Economics Case Study: Pinehedge Farm – Josef Heinzle



Case Study: Pinehedge Farm – Josef Heinzle

- 65-70 milking cows, yogurt production facility, 6 m³/day manure
 - Equiv. to 1000 finishing hogs, or 100 sows F-F, or 300 sows SEW
- 500 m³ single digester tank
- 100 kW MAN gas engine – Martin Machinery – Missouri
- Roofing rubber for dome

Costs

- Generator: \$120k
- Digester tank: \$100k
- Electrical \$42k
- Power line and transformers \$26k
- Mixer and motor \$15k
- Excavation \$23k
- Powerhouse (shed) \$21k
- Plumbing and heat transfer \$23k
- Manure transfer \$20k
- Other miscellaneous costs...
- **Total: \$400,000**

- **Revenue:**
- 100 kW, 8000 hours, ~12¢/kWh (blended SOP price) = **\$90,000/year**
 - *Requires very rich diet or won't achieve this production level*
- Tipping fees
 - ~2000 m³/year manure
 - Assume up to ~1000 m³ off-farm materials under C of A (25-50%)
 - Needed in order to achieve 100 kW
 - Assume low \$20/tonne
 - **\$20,000/year**
- Heat replacement at yogurt plant
 - Unsure of \$ value at this point
- Environmental Attributes (GHG credits)
 - Tough market, and under RESOP, farmer cannot claim these
- RED program: grant **~\$120,000** one time

More Information

- Biogas Funding Program:
 - www.ontario.ca/biogas
- Growing the Margins: Energy, Byproducts and Bioproducts for Farm and Food Conference
 - April 1-5, 2008 in London, Ontario.
 - www.gtmconf.ca

